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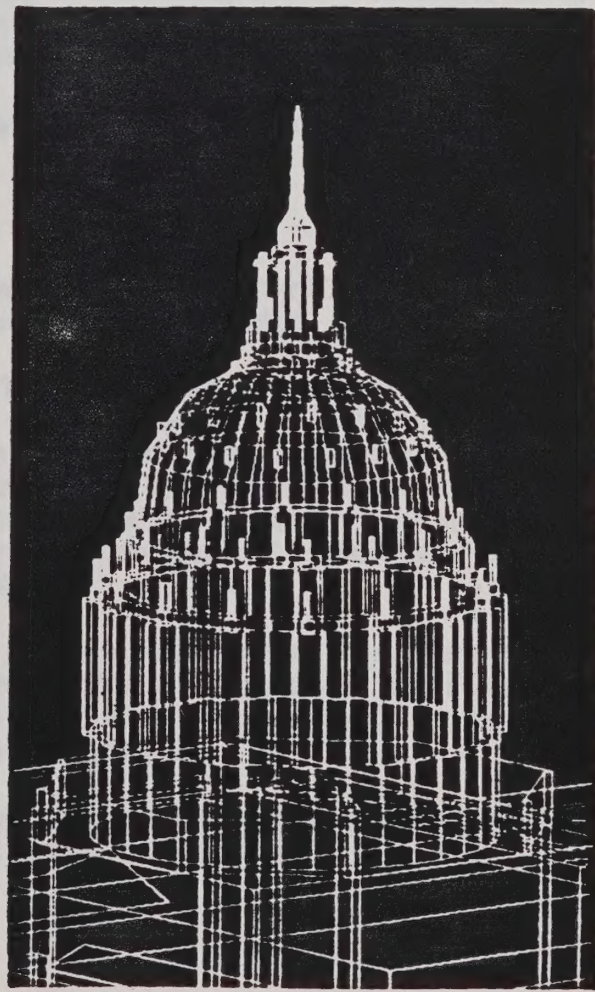
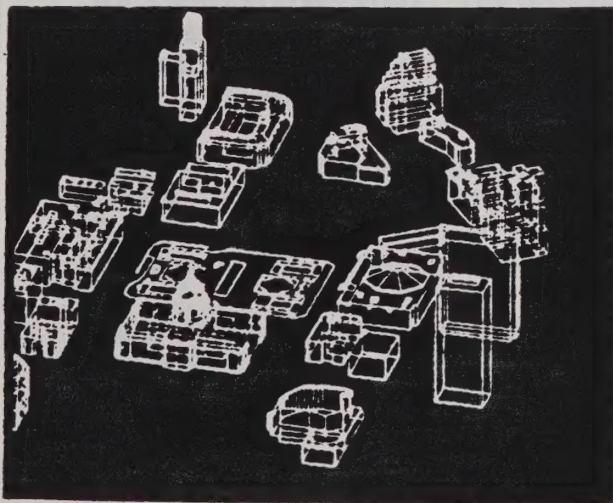
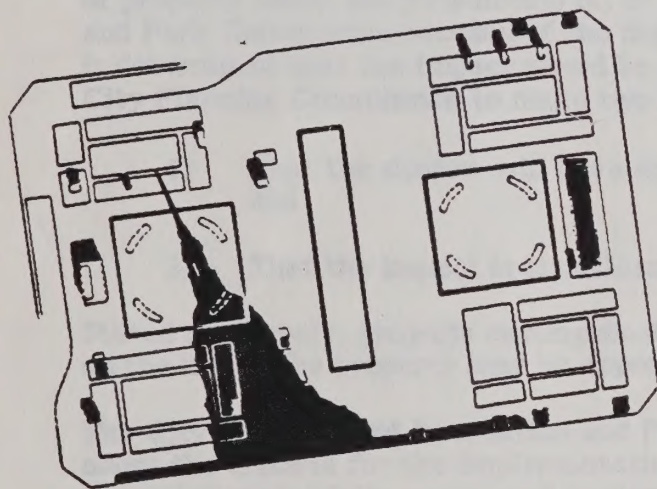
MEMORANDUM

TO : City Planning Commission
Recreation and Park Commission

October 22, 1987

FROM: Department of City Planning

Re: Proposition K—The Sunlight Ordinance



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INTRODUCTION

Proposition K, the Sunlight Ordinance, was passed by the citizens of San Francisco on the June 1984 Ballot in response to a growing concern about shadow impacts of buildings on the city's open spaces. The ordinance included all properties under the jurisdiction of or designated for acquisition by the Recreation and Park Commission.

Although Proposition K generally does not permit any new structures to create new shadows on these properties between one hour after sunrise and one hour before sunset, it does allow some exemptions. The first of the exemptions include those new buildings which do not exceed 40 feet in height as provided in the City Planning Code. A second exemption applies to those new structures which replace existing buildings (built before June 6, 1984) at precisely the same height and configuration. A third exemption applies to projects which were at certain stipulated stages in the permit approval process at the time the proposition was approved for the ballot by the Board of Supervisors.

The fourth exemption, which is the subject of this memorandum, relates to language in the proposition which states that the City Planning Commission shall disapprove a permit "if it finds that the proposed project will have any adverse impact on the use of property under the jurisdiction of, or designated for acquisition by, the Recreation and Park Commission because of the shading or shadowing that it will cause, unless it is determined that the impact would be insignificant." This language requires the City Planning Commission to make two findings:

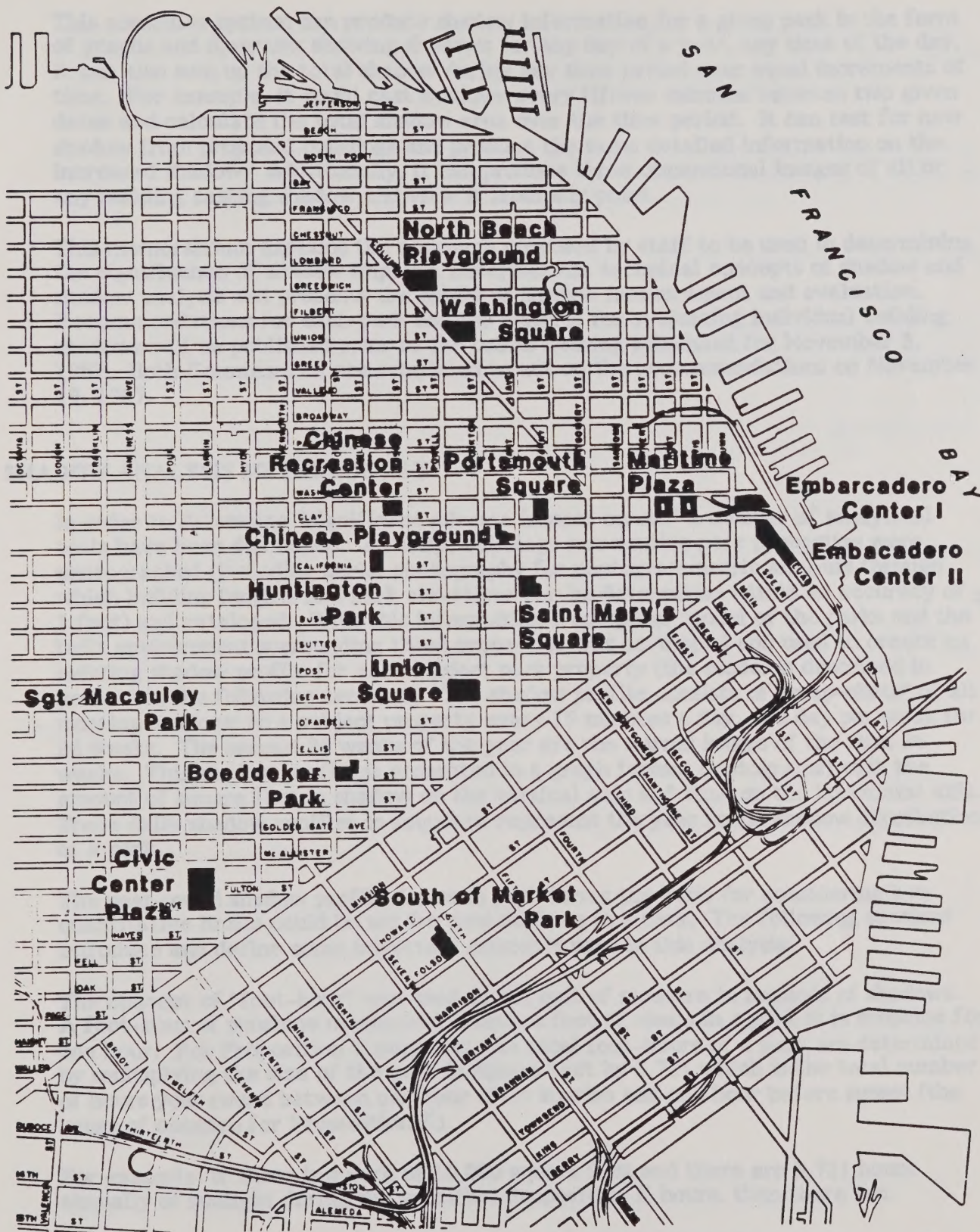
- 1) That the shadow will have an adverse impact on the use of the property, and
- 2) That the impact is significant.

Stated conversely, projects casting shadows which have no significant adverse impact on the use of the property may be approved by the Commission.

The City Planning and Recreation and Park Commissions are required to jointly adopt the criteria for the implementation of Proposition K. In January, 1985 these Commissions initially considered implementation criteria and requested additional information from staff. The information requested by the Commissions required a "supplemental appropriation in order to fund an analysis of fifteen open spaces in the Downtown area that could be shadowed by new development" (Resolution No. 13887). These open spaces are shown on Map 1.

The City through the Department of City Planning, entered into an agreement for professional services with the University of California at Berkeley. The Planning Department and UCB began working together to develop the methodology necessary to provide the Commissions with the requested analysis.

Following a period of modeling and analysis the computer system was developed to the point where implementation standards could be considered.



LOCATION OF PARKS

↑
Map 1



LOCATION OF LAKE

Fig. 1

This computer system can produce shadow information for a given park in the form of graphs and diagrams showing shadows for any day of a year, any time of the day. It can also sum up the total shadow during any time period over equal increments of time. For example, it could cast shadows every fifteen minutes between two given dates and calculate the total shadow area over the time period. It can test for new shadow from proposed buildings and produce the same detailed information on the increased shadow. Additionally, it can produce three dimensional images of all or any building casting shadow and view it from any point.

This memorandum explains the approach proposed by staff to be used in determining the significance of shadow impacts, describes the technical concepts of shadow and shadow analysis and presents the model of shadow measurement and evaluation. Recommendations for each park and the criteria for evaluating individual building shadows will be published prior to the public hearing scheduled for November 5, 1987. Both Commissions are scheduled to act on the recommendations on November 19, 1987.

SHADOW ANALYSIS METHODOLOGY

In order to determine "significant adverse impact on use" a number of analytical tools have been developed. Initially, buildings surrounding park properties were photographed (including aerial photography for photogrammetric analysis through which building heights and park elevations can be determined within an accuracy of ± 1 foot) and cataloged. With this information a computer model of the parks and the built environment surrounding these properties was developed and used to create an existing shadow profile for each subject park property (the model is described in general in the following sections). The shadow profile consists of "snap-shots" of all existing shadows on a subject property every 15 minutes a day, one day per week for 26 weeks. The second 26 weeks of the year are the mirror image of the first 26 weeks. This shadow profile is presented in a graph format (histograms) with the amount of square feet in shadow on the vertical axis and time on the horizontal axis. These daily shadow profiles in sequence represent the year round shadow distribution of a park.

The year round shadow profile for each park forms the basis for considering how quantitative limits could be set for new shadows in a park. The following sections introduce and define some important concepts used in this analysis.

The concept of "foot-hour" was used as the unit of measure in analysis of shadows. A foot-hour of sunshine means that a square foot of space in a park is in sunshine for one hour. For Proposition K purposes, the total foot-hours of a park are determined by multiplying the size of the park in square feet by 3,721 which is the total number of hours year round between one hour after sunrise and one hour before sunset (the hours of concern for Proposition K).

For example, if there is a park of 10,000 square feet and there are 3,721 hours annually of sunlight during the specified Proposition K hours, then there are:

$$10,000 \text{ square feet} \times 3,721 \text{ hours} = 37,210,000 \text{ Total foot-hours}$$

The first part of the report is a general introduction to the project. It describes the purpose of the study, the objectives, and the scope of the work. It also provides a brief overview of the methodology used in the study.

The second part of the report is a detailed description of the methodology used in the study. It includes a description of the data collection methods, the data analysis methods, and the statistical tests used.

RESULTS AND DISCUSSION

The results of the study are presented in this section. It includes a description of the data, a description of the results of the statistical tests, and a discussion of the findings. The discussion includes a comparison of the results with the objectives of the study and a discussion of the implications of the findings.

The third part of the report is a conclusion. It summarizes the findings of the study and provides a final statement on the results.

The fourth part of the report is a list of references. It includes a list of the books, articles, and other sources used in the study.

The fifth part of the report is an appendix. It includes a list of the tables and figures used in the study.

APPENDIX A: LIST OF TABLES AND FIGURES

Foot-hours can be calculated for either sun foot-hours or shadow foot-hours. The amount of shadow in square feet multiplied by the Proposition K hours equals shadow foot-hours. Similarly, the amount of park area in sunshine multiplied by the Proposition K hours equals sun foot-hours.

If the daily shadow profiles show that there are 9,302,500 shadow foot-hours (sfh) in shadow over the entire year, that means 25% ($9,302,500/37,210,000 \times 100 = 25$) of the park's total foot-hours is already used up by existing shadow, and,

$37,210,000 \text{ total ft.-hrs.} - 9,302,500 \text{ shadow ft.-hrs.} = 27,907,500 \text{ sun ft.-hrs.}$ or 75% of the total yearly sun resource is still available.

If, for example, an absolute limit of 10% of the total foot-hours is set for this park it would mean that no more than 3,721,000 additional shadow foot-hours would be ever allowed in this park ($0.1 \times 10,000 \times 3721$).

The 3,721,000 shadow foot-hour "account" for the park could be used up with a new shadow of 1,000 square feet which lasts all day every day of the year, i.e.

$$1,000 \text{ square feet} \times 3,721 \text{ hours} = 3,721,000 \text{ shadow foot-hours}$$

The 3,721,000 shadow foot-hour account could also be used up by a 2,000 square foot shadow that appears in the park only half the time.

From these two examples it can be seen that a small shadow that lasts for a long time can be the same shadow foot-hours as a large shadow which lasts for less time.

Criteria for Determining Significance

What amount of shadow will have "significant adverse impact on use?" Answering this question requires information about the specific park involved and the characteristics of the shadows that exist currently and the shadow that would be created by the project under consideration.

The approach recommended by staff involves two steps. The first step is to set an absolute limit for new shadow allowed in an open space (Absolute Limit). The Absolute Limit is expressed as a percentage of the total foot-hours for each park (described below). This percentage represents the amount of increased shadow permitted as an Absolute Limit for each park. The second step is to determine individual building impacts and allocate a portion of the additional allowable shadow among specific projects within the Absolute Limit.

Absolute Limit

It is possible to set a quantitative cap for the amount of new shadow which could be allowed in each park based on the current shadow conditions in the park

It is a pleasure to have you here today. The purpose of this meeting is to discuss the progress of the project and to plan for the future. We will be reviewing the work that has been done so far and discussing the challenges that lie ahead.

The first item on the agenda is the report on the progress of the project. This will be followed by a discussion of the challenges that we are facing and a plan for how to overcome them. We will also be discussing the budget and the timeline for the project.

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Conclusion

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and the size of the park. A large park with little shadow could be permitted a larger absolute limit than a smaller park with a lot of shadow, for example.

This absolute limit could be used up by one or more new buildings, but, the final determination of how much of this limit could be used by an individual building and what form the new shadow will take should be determined on a case by case basis. However, any shadow cast beyond this limit would be considered significant and could not be allowed.

Allocation of The Absolute Limit Among Individual Buildings

Each open space has distinctive characteristics of existing shadows and the shadow that would be created by a new building. Each potential shadow also has distinctive characteristics. Depending on the proposed new building's location the shadow could be fast or slow moving (shadows of buildings near the open space will move through the open space slower than a building farther away from the open space). The proposed new building's height and location will also determine the size and shape of potential new shadow in the park, when (e.g. time of day, time of season) and where in the park the new shadow would be cast. Since a potential shadow may have immensely varied impacts at different times of day, or different seasons, or duration of the shadow, or the size or the location of the shadow, the evaluation of impact depends on a variety of qualitative factors.

Continuing with the example of the park above, if it were determined that a small shadow that lasted all day every day of the year would affect the use of the park (e.g. it put enough of the park in shade that people would no longer eat their lunches in the park), then this shadow should not be allowed even though the amount of additional shadow foot-hours was within the Absolute Limit. This reasoning can be carried out to an infinite number of scenarios. After the new shadow has been determined not to exceed the Absolute Limit, therefore, it is important to consider each building's shadow contribution or performance throughout the year.

The factors to be considered in allocating additional shadow within the absolute limit will vary from park to park based on the characteristics of that park and the pattern of its existing shadows. In the case of a downtown park it may be more important to preserve the mid-day sun during all seasons and only allow small, fast moving shadows. These criteria would assure that the park users during the day would be able to enjoy sun during the lunch hours.

In the case of a neighborhood park it may be more important to preserve sun in the morning and afternoon hours during the Summer and Fall and only allow small shadows of any duration. This would assure the neighborhood of a protected sun resource in the morning before work and in the afternoon for post work day activities during the Summer and Fall.

Qualitative criteria for each park should be developed based on existing shadow profiles, important times of day, important seasons in the year,

size and duration of new shadows and the public good served by buildings casting new shadow. These bases are explained below:

Value of the Sunlight

- Time of Day (morning, mid-day, afternoon)
Based on existing shadow conditions and location of a given park, the time of day values of sunlight will have to be established. For example, afternoon and morning sun resources may be more important for preservation in neighborhood parks whereas mid-day sun may be more important in downtown parks. Additionally, some parks may have more shadow during certain times of the day when compared with other parks.
- Time of Year (Spring, Summer, Fall, Winter)
In the same way that the time of day value of sunlight has to be established, sunlight value during times of year will also have to be determined.

Shadow Characteristics

- Size of Shadow
Small shadows will generally be preferred to large shadows unless they last for long periods of time or fall on parts of the park where sunlight is particularly critical to users.
- Duration of Shadow
Shadows lasting a short period of time will generally be preferred to shadows which last a long time unless the fleeting shadows fall during a critical time of day or season and/or are so large that they disrupt use of the park.
- Location of Shadow
Efforts should be made to avoid shadows in areas of the park where existing or future use of the park is intense and where a new shadow could have detrimental effects on park vegetation.

Building Characteristics

- Public Good Served By Shadow Caster
Buildings in the public interest in terms of a needed use or building design and urban form may be allocated a larger portion of the Absolute Limit than other buildings. For example, the Civic Center Urban Design Plan calls for a building at the same height as the existing library to continue the cornice on Marshall Square thus completing the gap in the framing of Civic Center Plaza. A new library building to accommodate the growing needs of the Public Library is proposed at that space. This new building would cast new shadows in the morning hours on Civic Center Plaza. If the new building could not cast shadows, the ability to use the site for the library would be severely limited. Most of the Civic Center Plaza shadow "budget" could perhaps be allocated to be used by this library.

RECOMMENDATIONS

The Proposition K mandate is to minimize new shadow impacts and protect the sun resource on San Francisco open spaces. In order to accomplish this goal an Absolute Limit will be proposed for each individual park. Within this Absolute Limit, criteria for the approval of new buildings which can use up portions of this Absolute Limit will be proposed for each open space.

In the following pages individual parks are described in terms of their physical characteristics, shadow characteristics and use. Recommendations on the allowable Absolute Limit for each park and the criteria for evaluating individual building shadow on each park will be developed and published prior to the public hearing scheduled for November 5, 1987.

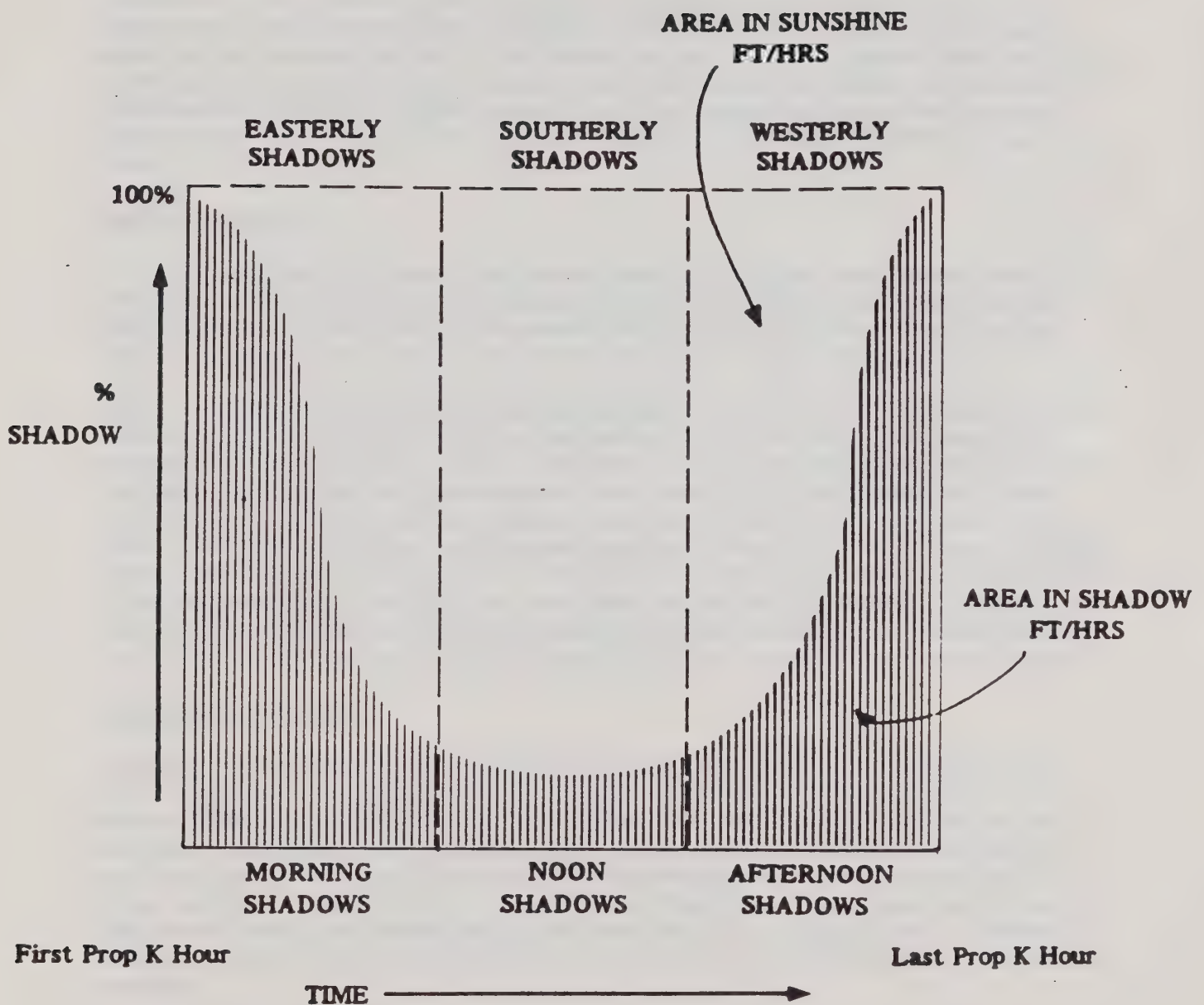
Distribution of Sunlight on Fifteen Downtown Open Spaces

This section, first, describes the general patterns of sun and shadow distribution in the parks as represented by the shadow graphs and diagrams. Second, it uses a standard format to summarize physical characteristics and existing shadow and sunlight conditions for each park. These shadow/sunlight conditions are represented by a series of graphs and diagrams. They show the existing conditions and also the maximum additional shadow condition that is possible if no limits were set and all sites in the city were developed to the existing height limits without concern for any bulk or other restrictions that may apply.

Shadow graphs for one day of each month (June, September/March, December) representing the amount of shadow and sunshine and how they change over time. Figure 1 explains the general structure of these graphs. The horizontal axis represents the time dimension and the vertical axis represents the quantity of shadow. The time at the origin is the first Proposition K hour (one hour after sunrise) and the time at the far right is the last Proposition K hour (one hour before sunset). The area under the curve is the amount of shadow over the number of hours represented by the horizontal axis or shadow-foot-hours. Similarly, the area above the curve represents the sun-foot-hours. Together they represent the total foot-hours of a park for that day.

The first third of the graph shows the shadows cast in the morning hours by buildings in the easterly direction from the park. The middle third shows shadows around the mid-day hours from buildings in the southerly direction and the last third the afternoon shadows from buildings in the westerly direction.

These graphs are accompanied by shadow diagrams which visually represent the areas of the parks in shadow or sunshine. Read together, the graphs and the diagrams provide the information on how much shadow, where they fall and how fast they move across a park.



STRUCTURE OF SHADOW GRAPHS

Figure 1

General Distribution

All fifteen open spaces examined are located in the downtown commercial or high density residential zoning districts (Map 1). The distribution of sunny and shady areas varies according to size. The largest open space, Civic Center Plaza, occupies an area of two city blocks; the smallest, Sergeant Macaulay Park measures a small fraction of a city block. Union Square, the third largest open space in downtown occupies one city block and Portsmouth Square in Chinatown is the size of half a city block.

Daily Distribution

The daily distribution of sunny and shaded areas on the small open spaces show 100% sunlight at mid-day in June. But soon after mid-day, shading occurs quickly. By mid-afternoon half or more of the area of the small parks in the group is shaded. Similarly, areas of the small parks stay shaded longer in the morning hours.

Graphs showing the sun-shadow distribution take the form of a "V" shaped curve for small open spaces. In contrast, the distribution for large open spaces generally follows a "U" shaped curve. That is, the base of the curve gets wider with the size of the park. This means, buildings located near the south side of a small park could have a larger impact on the sun resource than similar buildings located near large parks. Sunny areas of large open spaces stay sunny longer in the afternoon with little change over the mid-day condition. The amount of area in the sun decreases rapidly in the early evening. Similarly, on large open spaces, sunlight during the early morning hours becomes more rapidly available for an increasing surface area of the park. This results in the "U" shaped daily distribution curve for large open spaces.

Seasonal Distribution

The distribution of sunny and shaded areas stays relatively stable throughout the months between the Spring and Fall Equinox. The sunlight conditions deteriorate more rapidly from Fall to Spring. As a result, even the mid-day sun does not reach the entire open space and from day to day the sunny areas decrease more rapidly until only a quarter or half the open space receives mid-day sun in December. Only large open spaces such as Civic Center Plaza, Washington Square and North Beach Playground, which are surrounded by predominantly low buildings, are exceptions to this rule. In these areas, much of the open space stays sunny even during the Winter months.

Special Cases

There are a number of open spaces with distributions different from the curves described above. Maritime Plaza, for example, has a distribution curve similar to a small open space, although it ranks sixth in size among the fifteen parks. Its distribution curve is determined by the very large structures surrounding the plaza and the Alcoa Building in its center.

Maritime Plaza is also the most shaded open space in downtown San Francisco. In the Winter, only 10 to 15% of the park area is in the sun.

St. Mary's Square, near Kearny Street between California and Pine Streets, receives a large shadow from the Pacific Telephone Building on Pine Street during the mid-day for most of the year. This mid-day shadow peak becomes noticeable in August when 30% of the park is shaded. By mid-day in October, the area shaded increases to 90%, and remains for the rest of the year. Without the mid-day peak, the distribution curve would be very similar to Portsmouth Square a few blocks north of St. Mary's Square. This suggests that parks like St. Mary's could accommodate higher surrounding heights in the east, southeast, west and southwest directions with much less impact on sunshine than such heights in the southerly direction.

South of Market Park also has a unique sun/shadow distribution. Located in the South of Market area, the streets bordering the open space run at a 45 degree angle to north-south direction. As a result, this park receives more sun than open spaces of comparable size which are located on the north-south grid. The surrounding low story buildings also contribute to its unique sun/shadow distribution.

Park Specific Distribution

The summary information on each park, the shadow graphs and diagrams are presented in this section. At the very end is a table which lists parks by size and shows the existing shadow amount on each park and this amount as a percentage of total-foot-hours of each park. It also includes the amount of additional shadow that would be cast on each park if no shadow limits were set and all sites in the city were allowed to develop to their existing height limits.

PARK NAME: Civic Center Plaza

LOCATION: Polk, Grove, Larkin, McAllister
In the Civic Center, with major government offices, library and Brook Hall surrounding the open space.

SIZE: 222,995 square feet
Civic Center Plaza is the largest downtown park.

CHARACTERISTICS: Heaviest use occurs during mid-day hours. Users are civic center workers, tourists and street people. Some park furniture for sitting. This park is the location for many civic demonstrations and cultural activities. This is a relatively flat formal park. A parking garage is located beneath the park.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: 7.4% of the total year round sunshine is used up by existing shadows. Civic Center is one of the sunniest of the downtown parks. During most of the year the daily shadow distribution profile is that of a relatively flat "U" shape with greater shadows in the afternoon than in the morning. By Winter the "U" shape has flattened further by decreases in shadows early and late and increased shadows at mid-day.

Seasonal Shadow:

- **Summer:** Sunny all day except in the late afternoon hours when an average of less than 40% of the park is in shade. Some shadows very early in the morning and very late in the afternoon. Almost no shadows from 9 AM to 4 PM. Approximately 5% in shadows during the Summer Solstice.
- **Spring/Fall:** In general summer shadow conditions continue from the Spring and into the Fall. There are however less shadow impacts during the early morning hours and more shadows in the afternoon than occur during the Summer months. Approximately 5% in shadows during the Equinox.
- **Winter:** Nearly 75% of the park remains in sun during the Winter months. In late afternoon hours there are increased shadow impacts on the open space. Approximately 10% in shadows during the Winter Solstice.

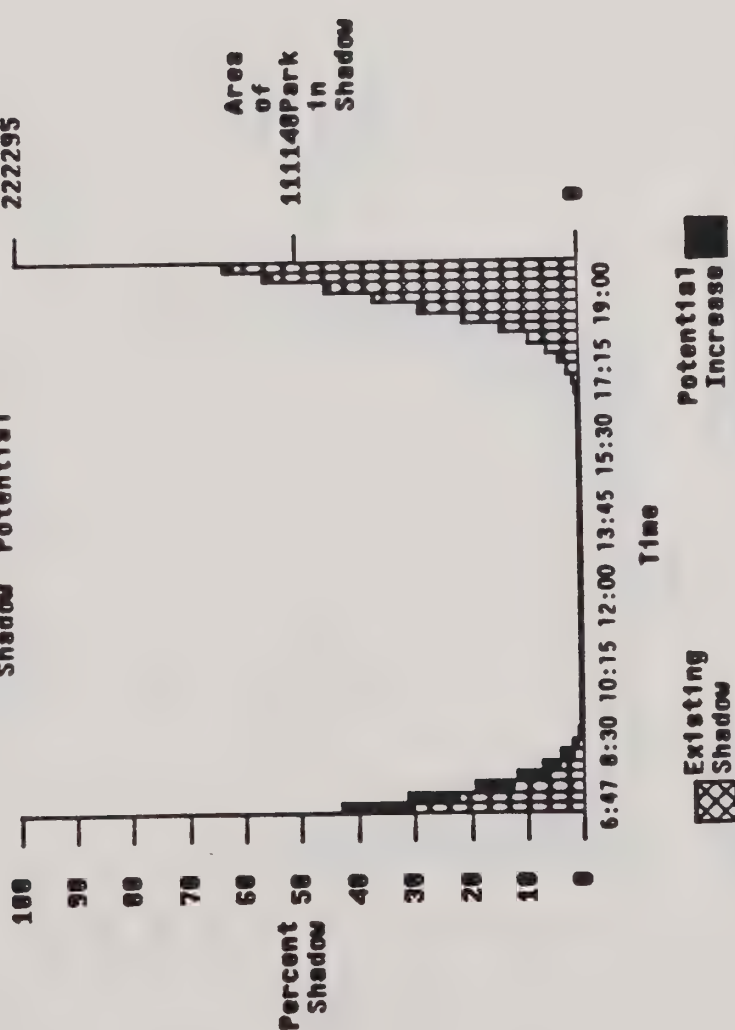
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Civic Center Plaza

June 21, 1987

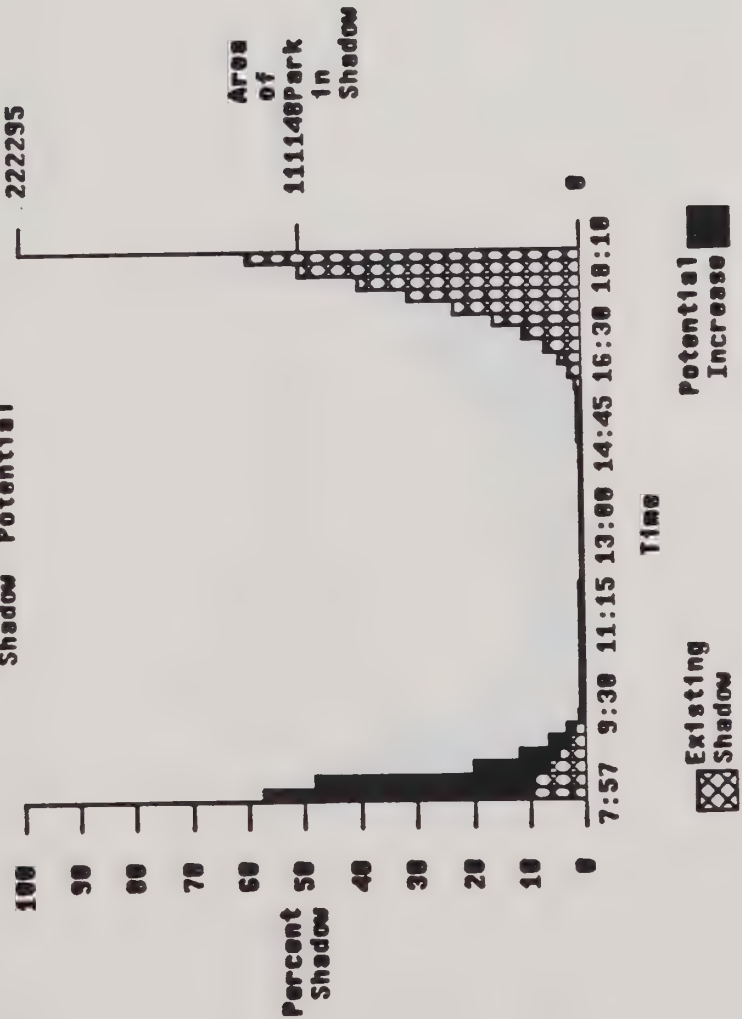
Shadow Potential



Civic Center Plaza

September 20, 1987 (March)

Shadow Potential



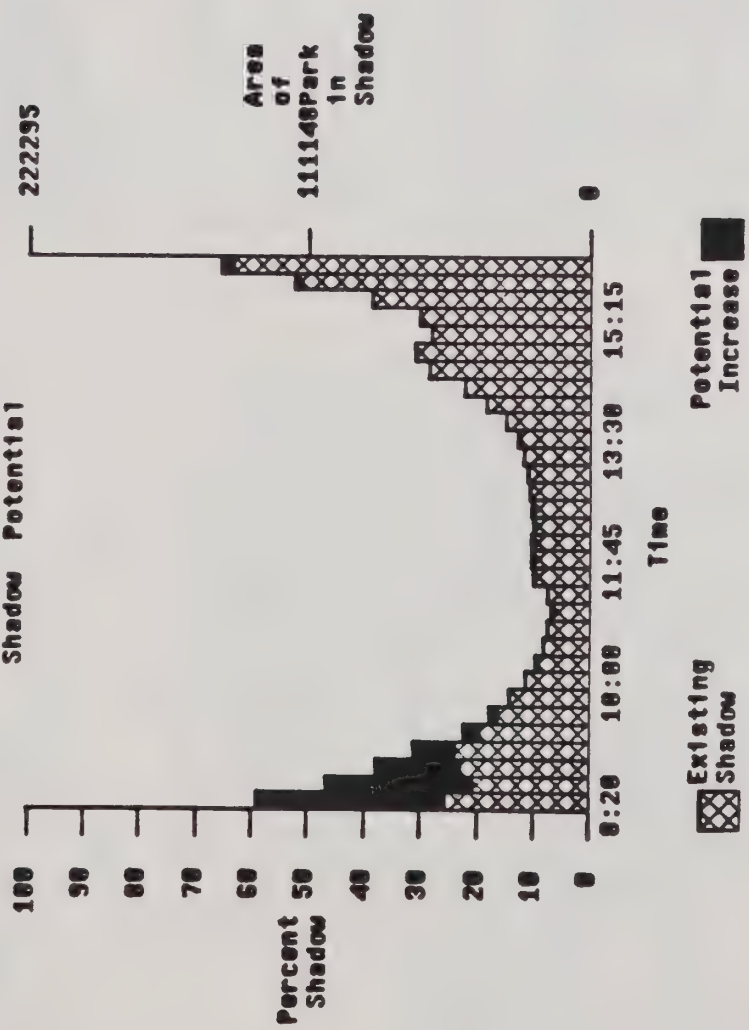
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Civic Center Plaza

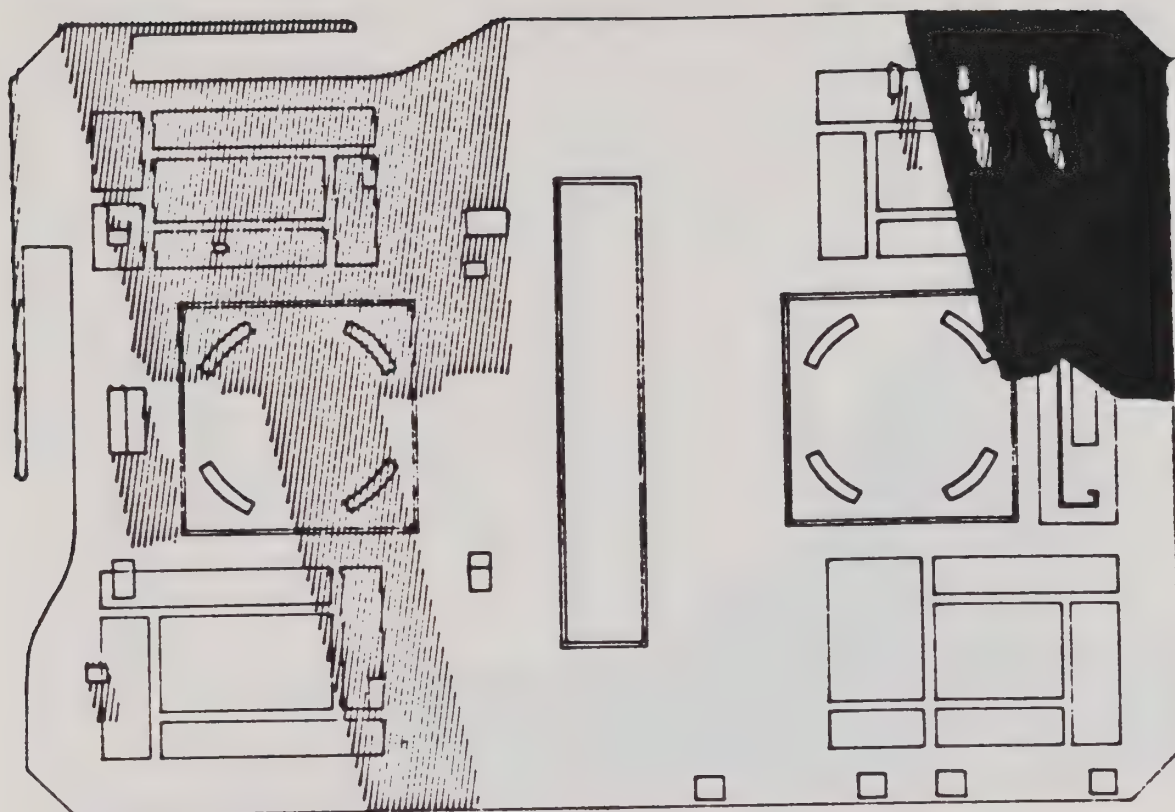
December 20 1987

Shadow Potential

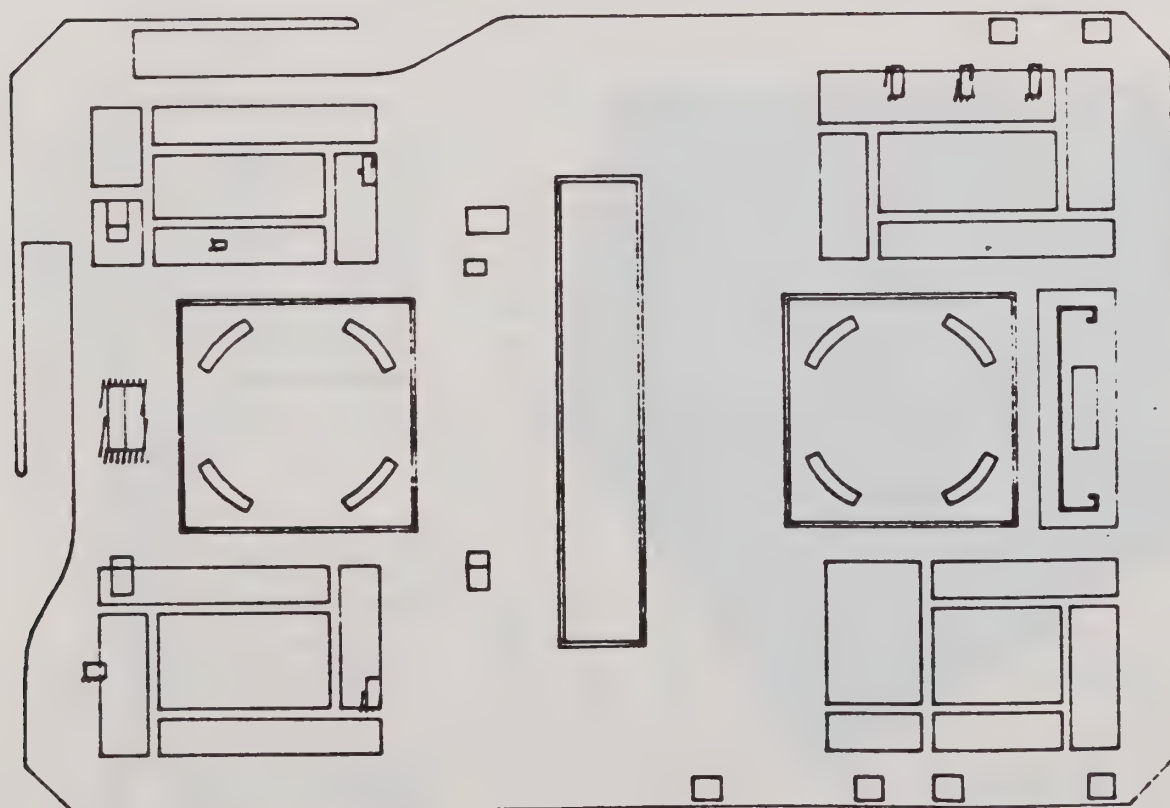


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
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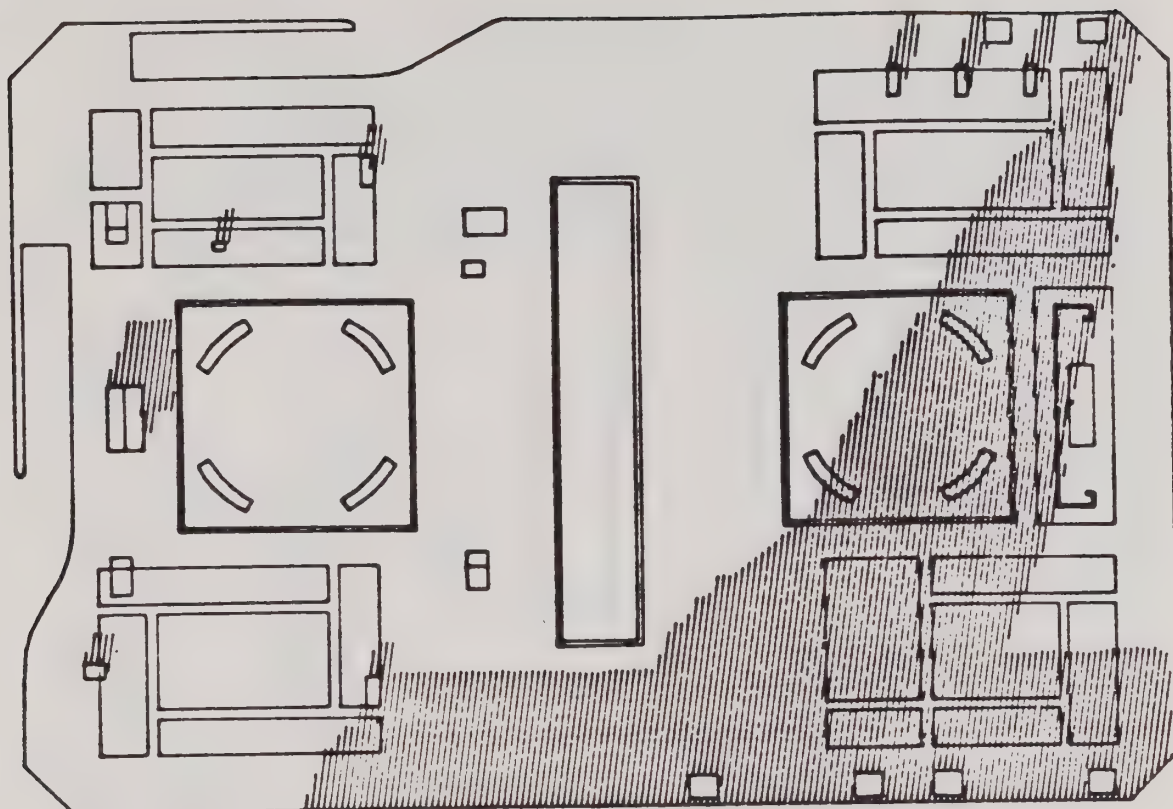


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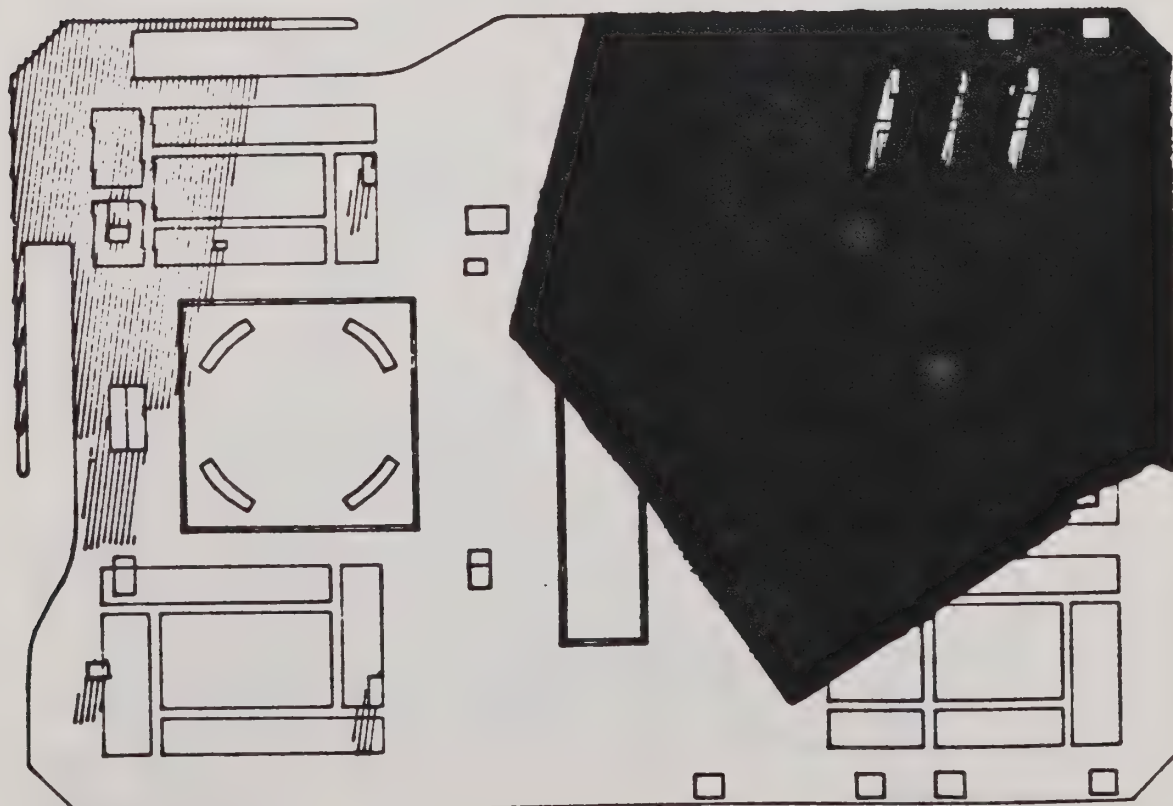
CIVIC CENTER PLAZA

 EXISTING SHADOW

 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
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


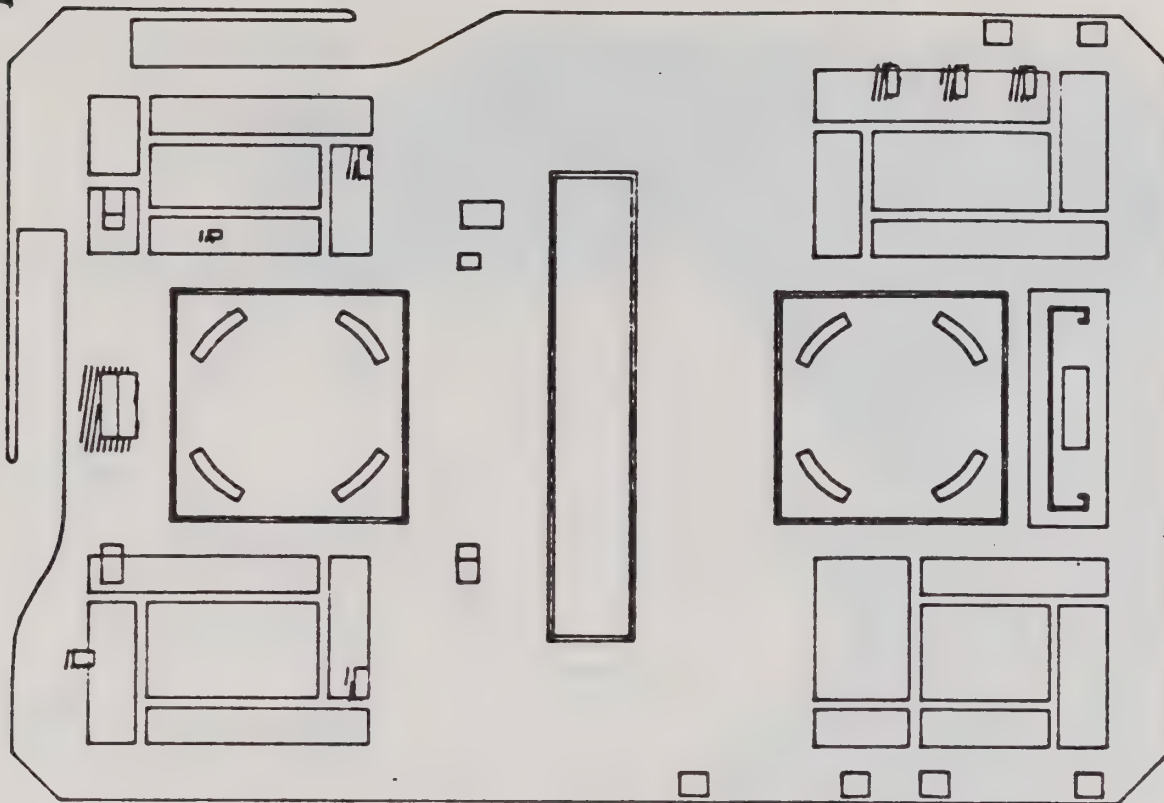
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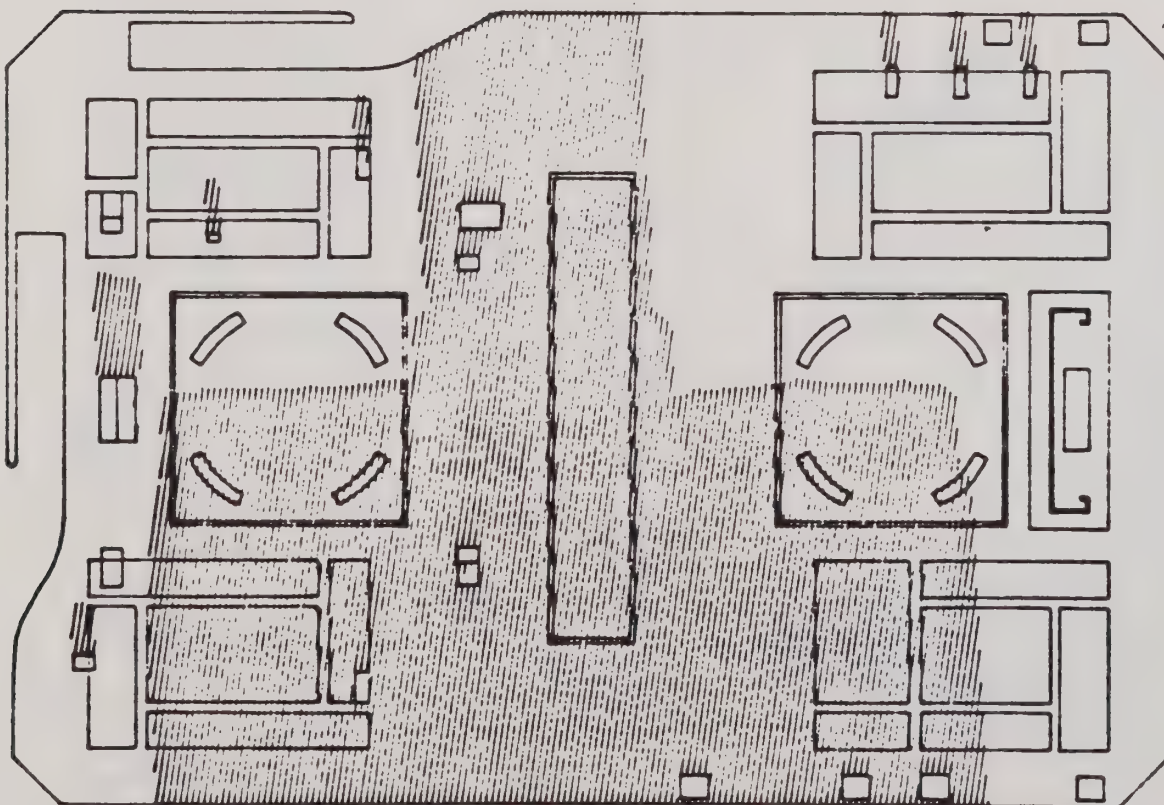
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 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED




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


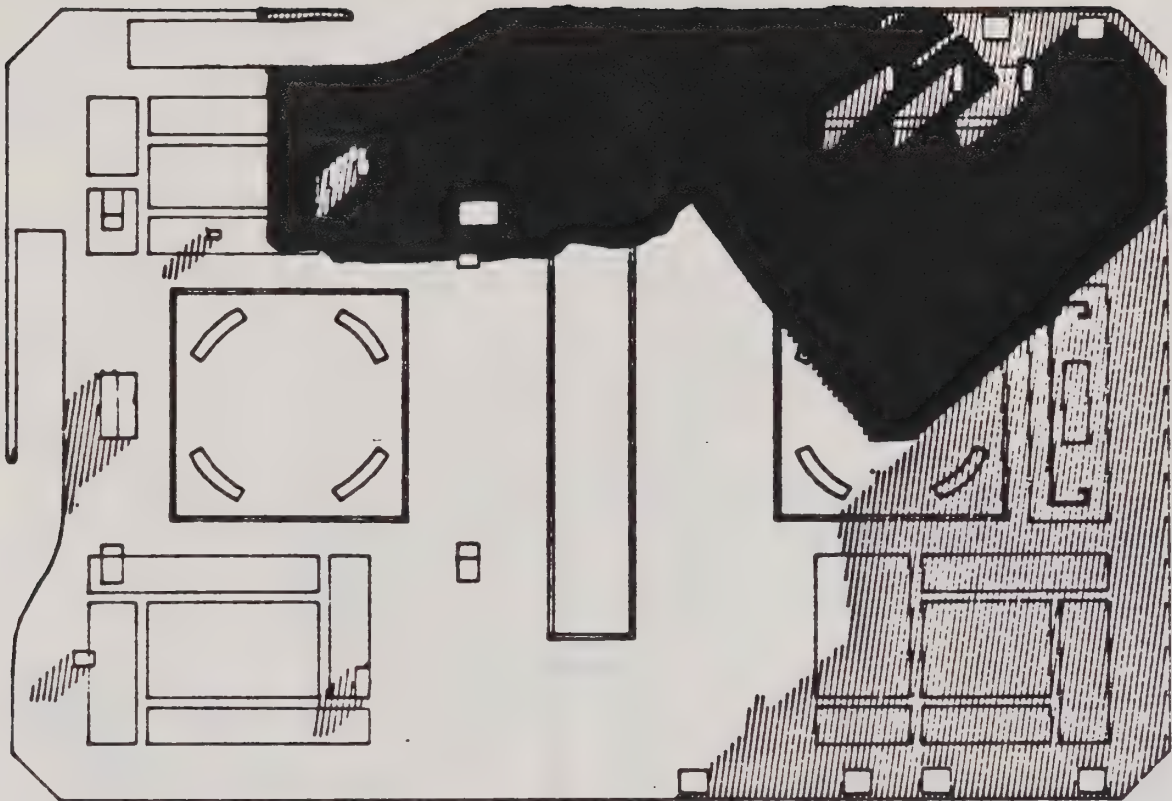
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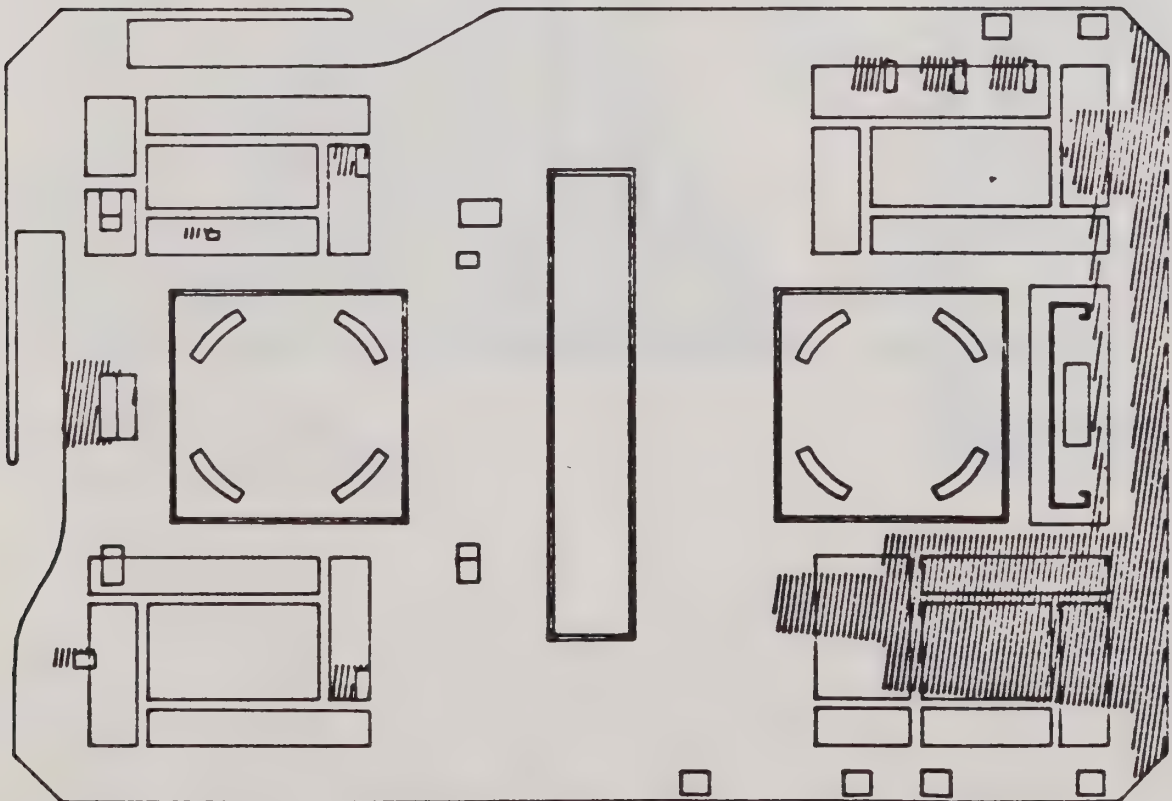
CIVIC CENTER PLAZA

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
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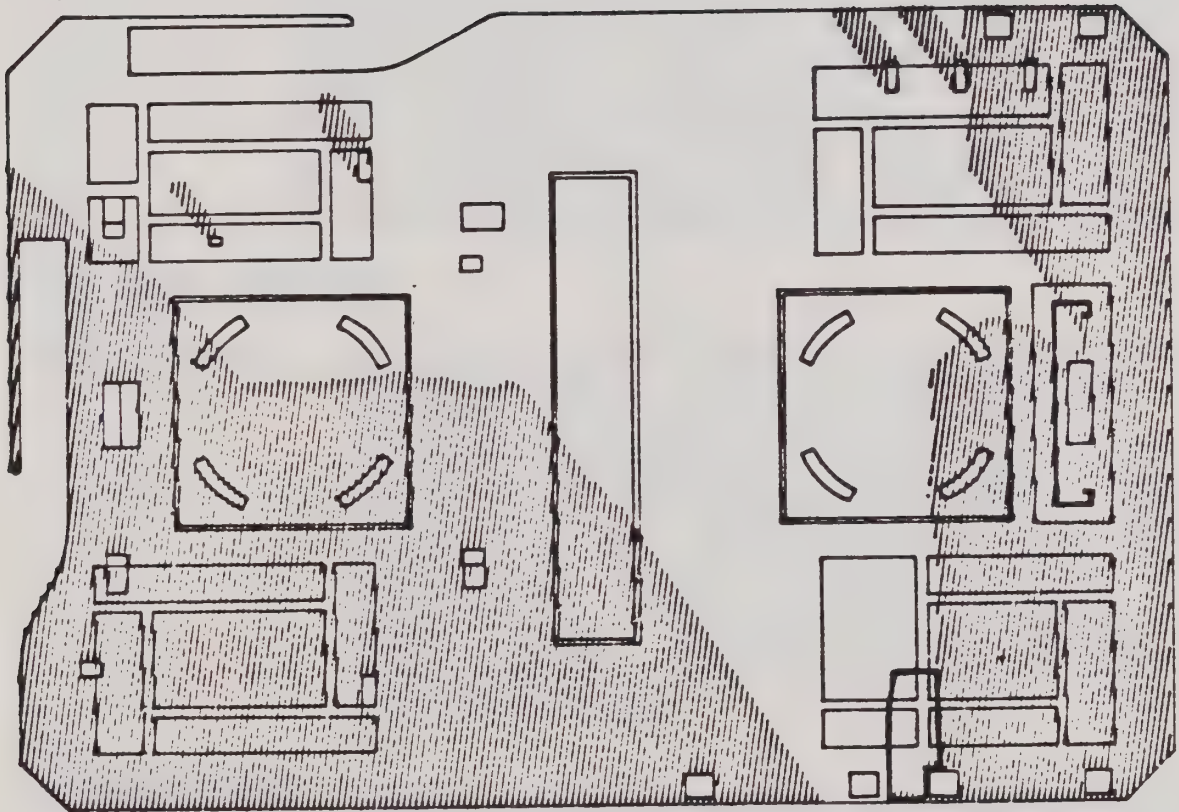


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 EXISTING SHADOW
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SHADOW IF NO LIMIT IS
IMPOSED



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 EXISTING SHADOW
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SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: Embarcadero Center 2

LOCATION: Embarcadero, Clay & Steuart
This open space is located at the Eastern edge of the Financial District.

SIZE: 149,698 square feet
The second largest Downtown park.

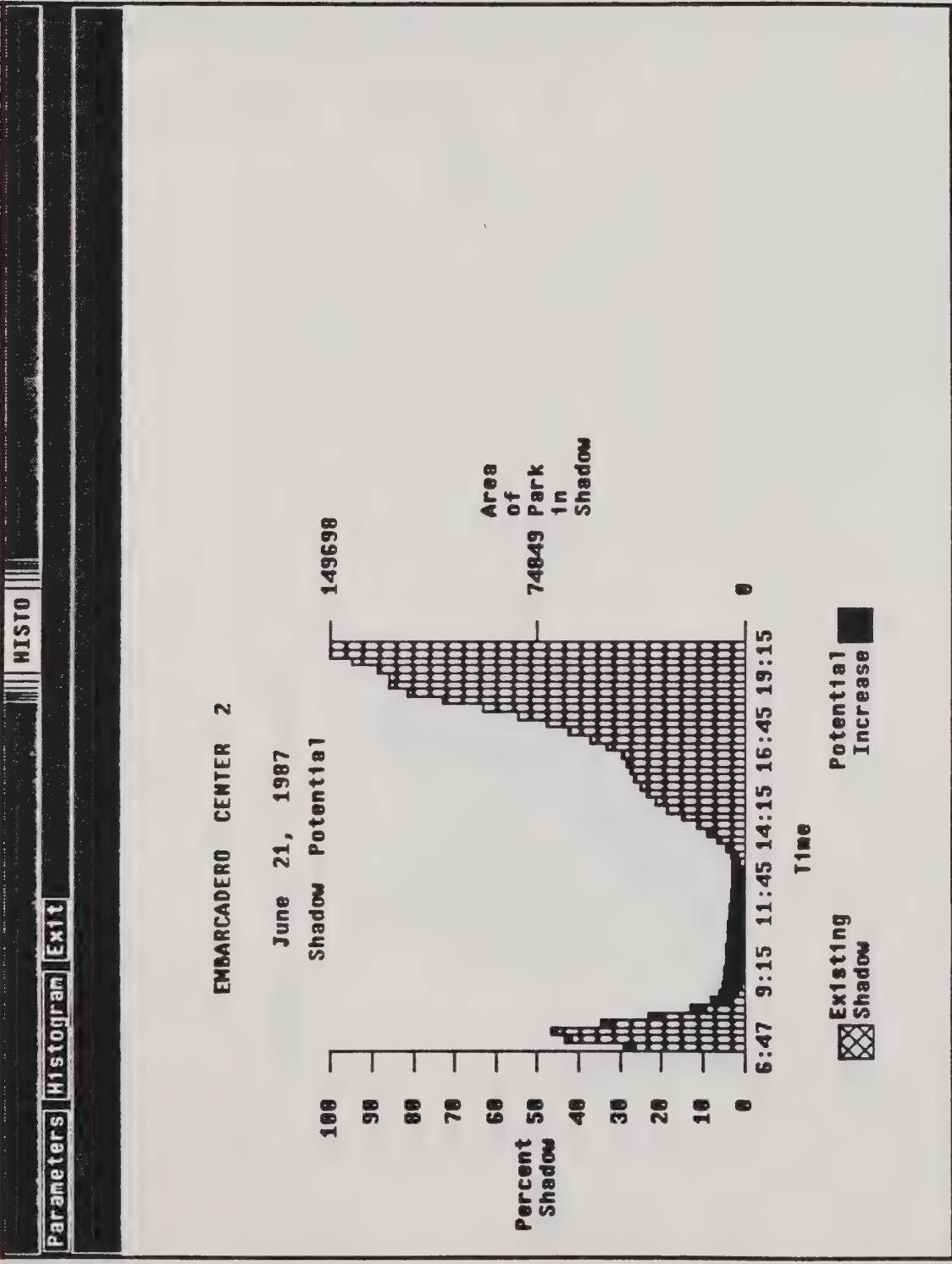
CHARACTERISTICS: This park is a plaza surrounded by large office buildings with many ground floor restaurants opening on to the space. The plaza contains a large fountain, open air cafes and is predominately paved. There is a flat grass area at the South end of the plaza. The space has excellent access from Market Street and South of Market Street. During lunch hour the park is heavily used by workers from the Financial District. Tourist use of the park is also heavy due to its location at the base of Market Street, proximity to the Ferry Building, California Street cable car line and the Hyatt Regency. Noon concerts, fashion shows and performances create a great deal of day use of the park.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: This open space has significant sun resources during the morning hours. Afternoon shadows are heavy. The "J" shape to the shadow profile is consistent throughout the Spring, Fall and Summer due to the morning sun and the heavy afternoon shadows. The "J" shaped shade curve disappears in the Winter. In the Winter no more than 50% of the park is in the sun after the noon hour. The shape of the curve in Winter is represented by a shaft of sun in the morning and a nearly solid block of shadow in the post morning hours. Overall, 37.6% of the annual sun resource is currently in shadow.

Seasonal Shadow:

- Summer: Between 8:30 am and noon there are almost no shadows in the plaza. Before 8:30 am nearly 40% of the space is in the shade. After the mid-morning sun the shadows gradually increase until 100% of the park is in shadow at the end of the day. 30% shaded during the Summer Solstice.
- Spring/Fall: For two hours in the mid-morning there is 100% sun in the park. After 11:30 am the shadows increase such that mid-afternoon shadows are greater than in Summer but never reach the 100% shadows of late afternoon Summer days. 60% shaded during the Equinox.
- Winter: During the Winter there is a brief two hour period where the park is in the sun. After 10 am shadows increase rapidly and by noon in mid-December 90% of the plaza is in the shade. 80% shaded during the Winter Solstice.

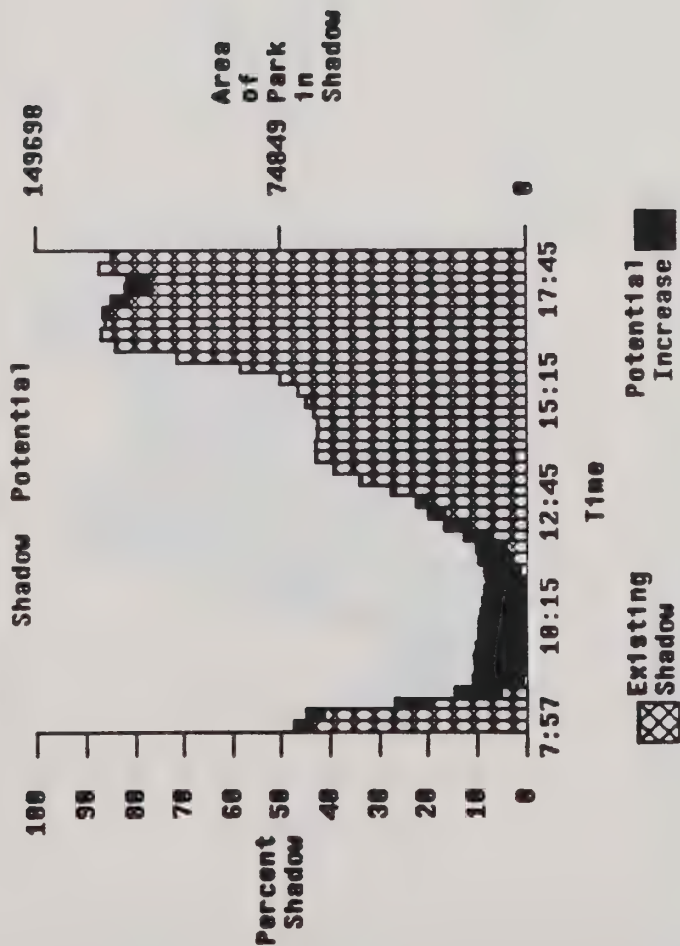


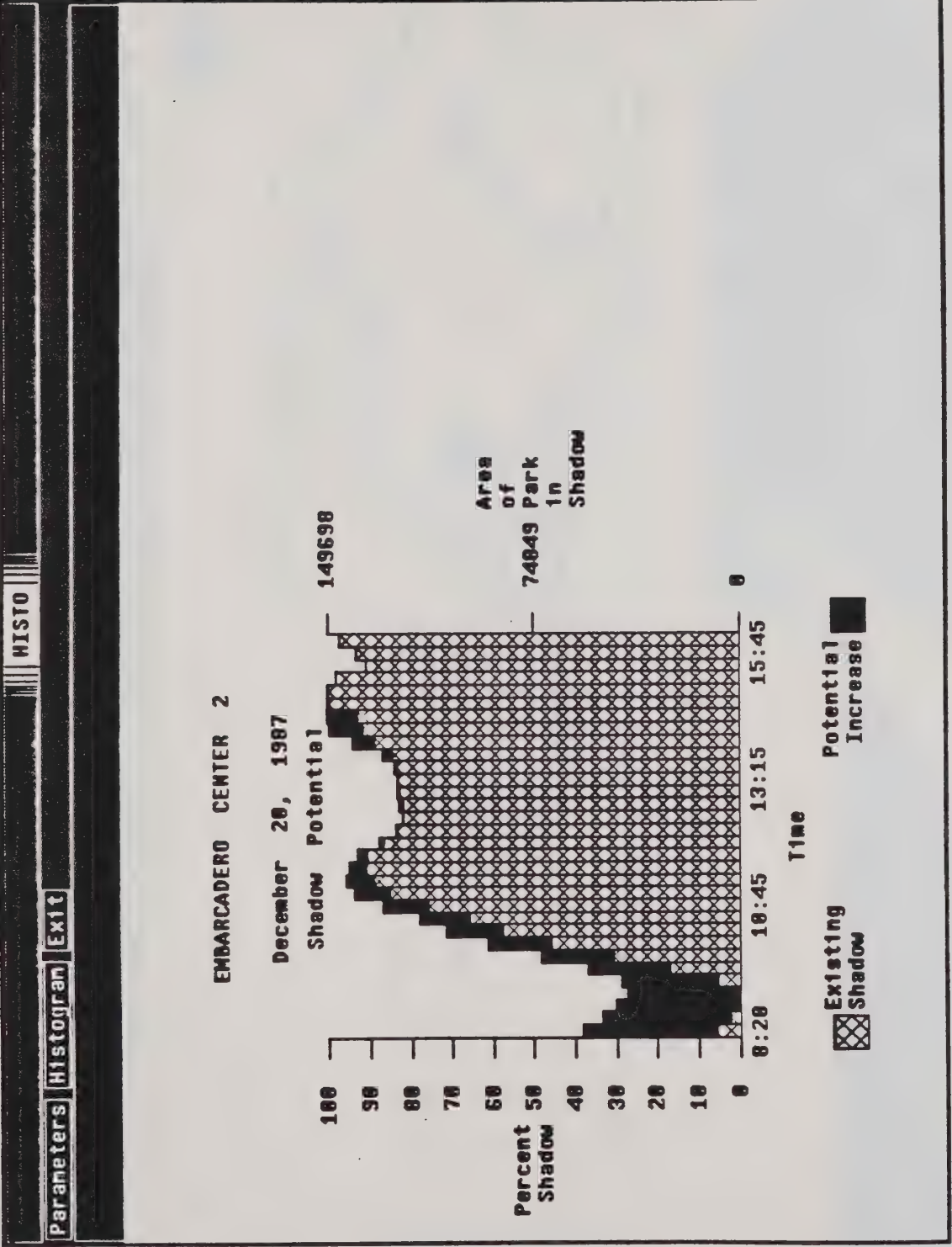
HISTO

Parameters Histogram Exit

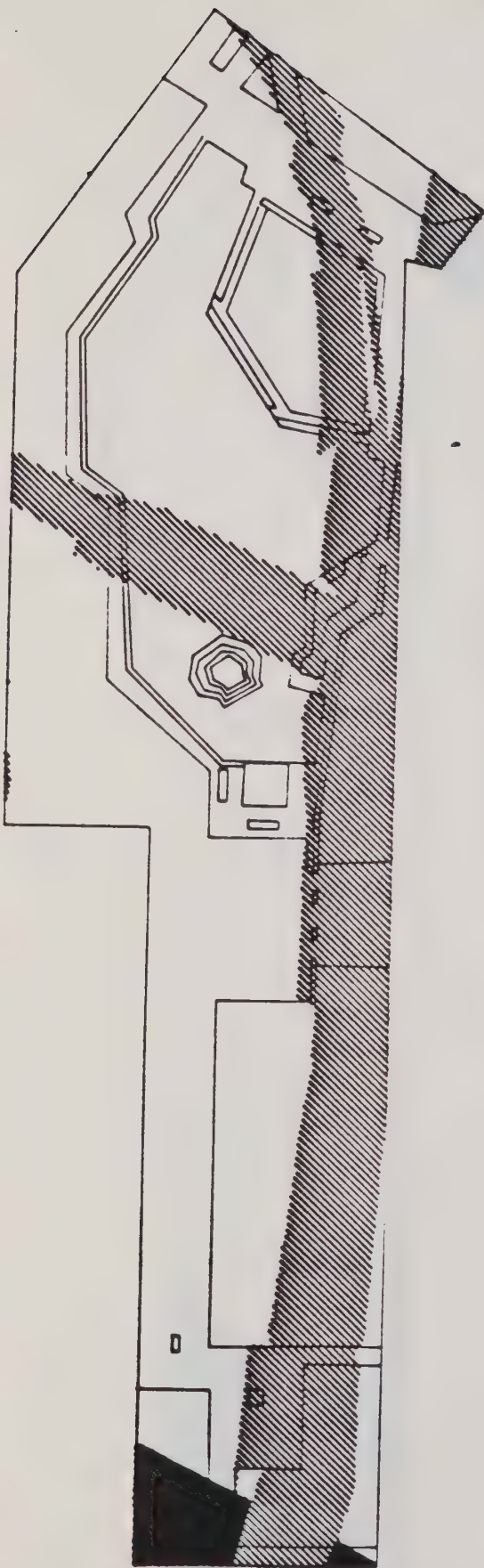
EMBARCADERO CENTER 2

September 28, 1987 (March)

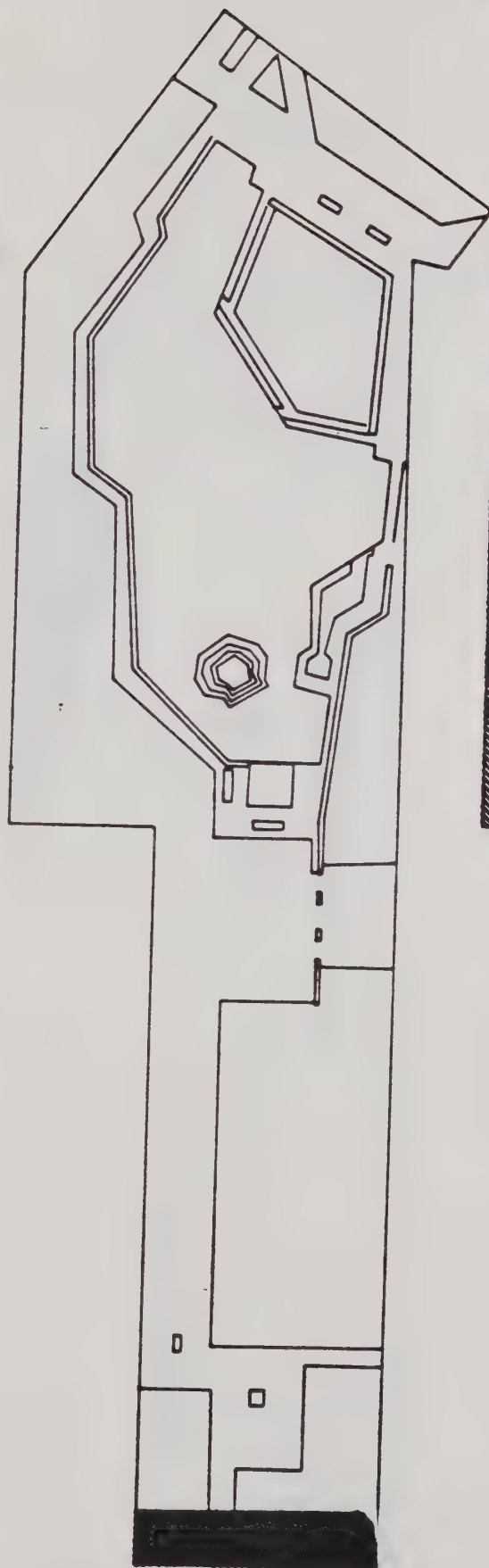




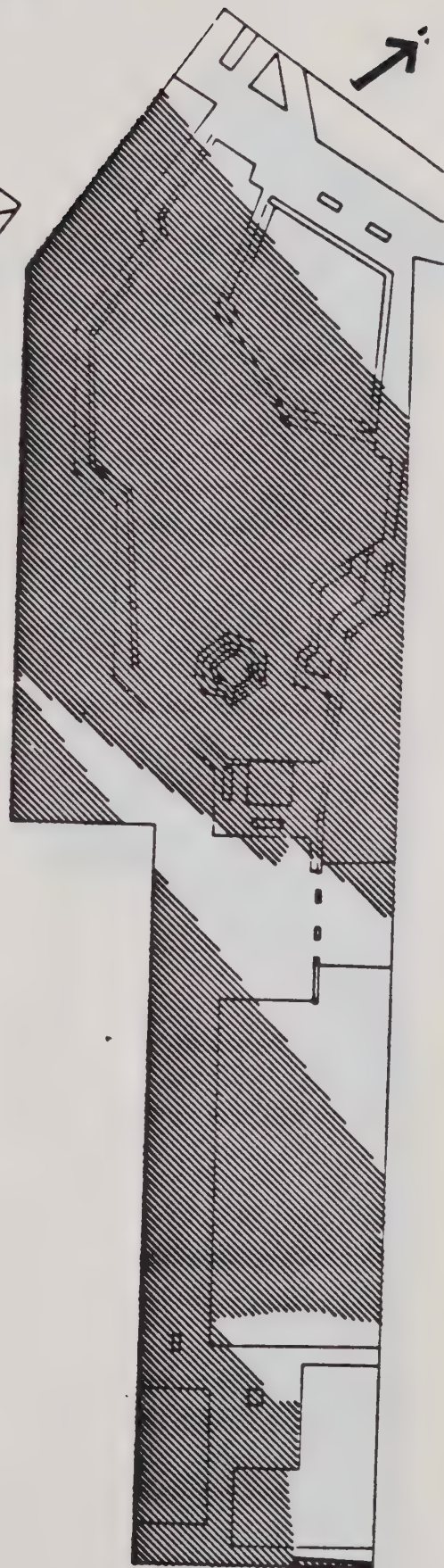




6/21 07:30



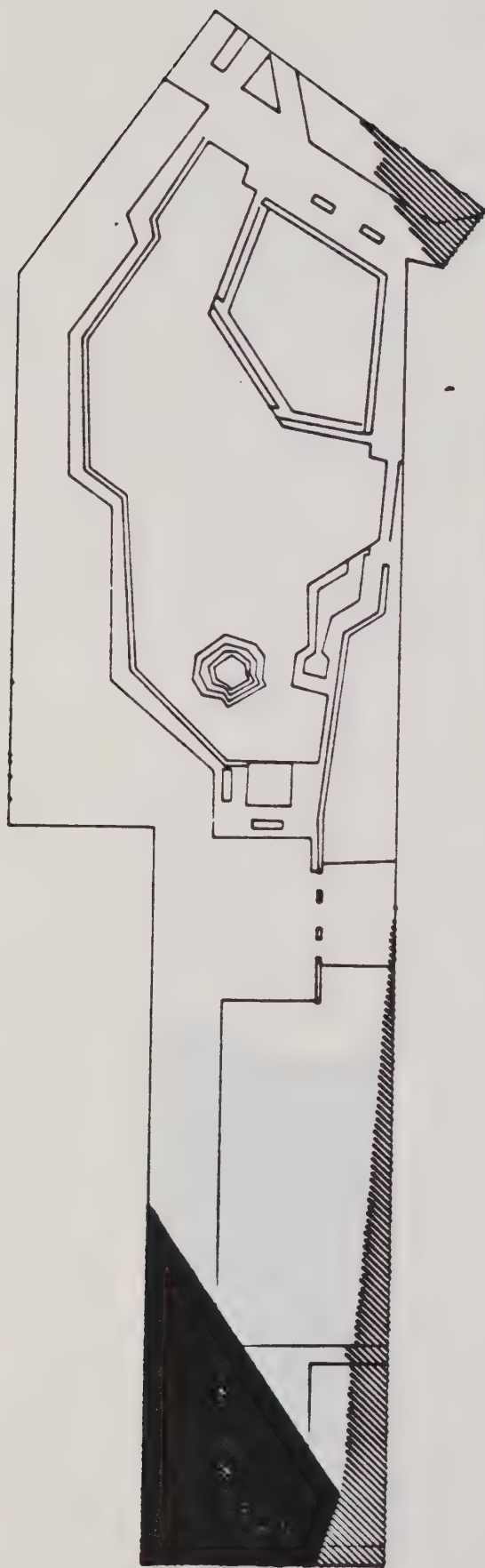
6/21 12:00



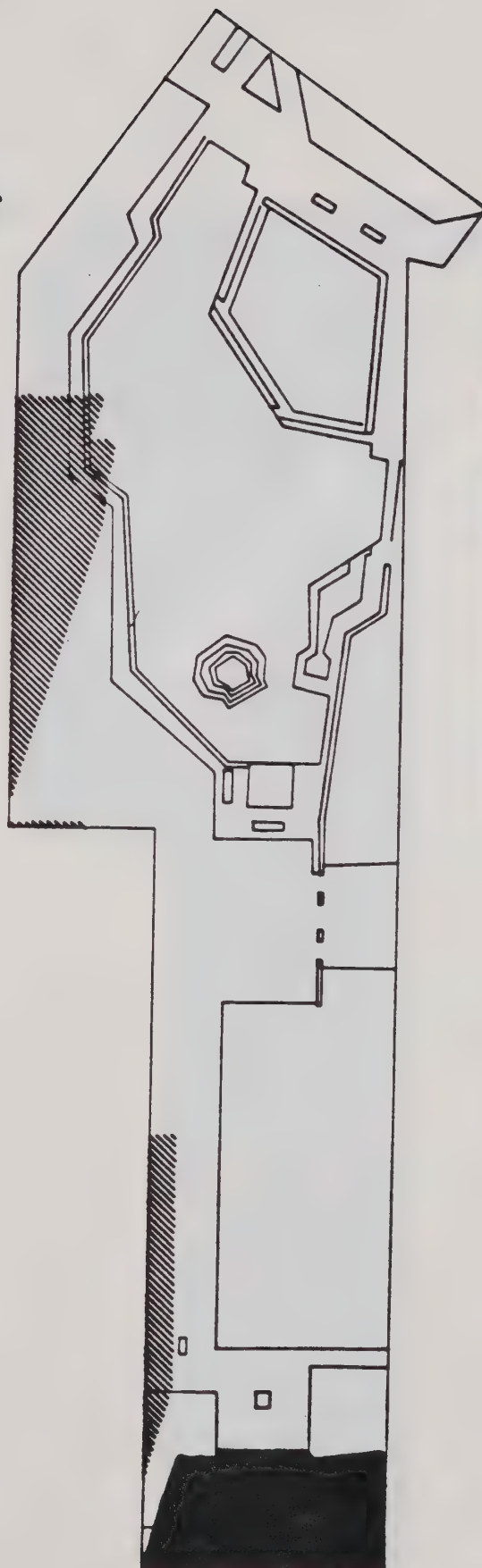
6/21 18:00
Scale: 1" = 100'

EMBARCADERO CENTER 2

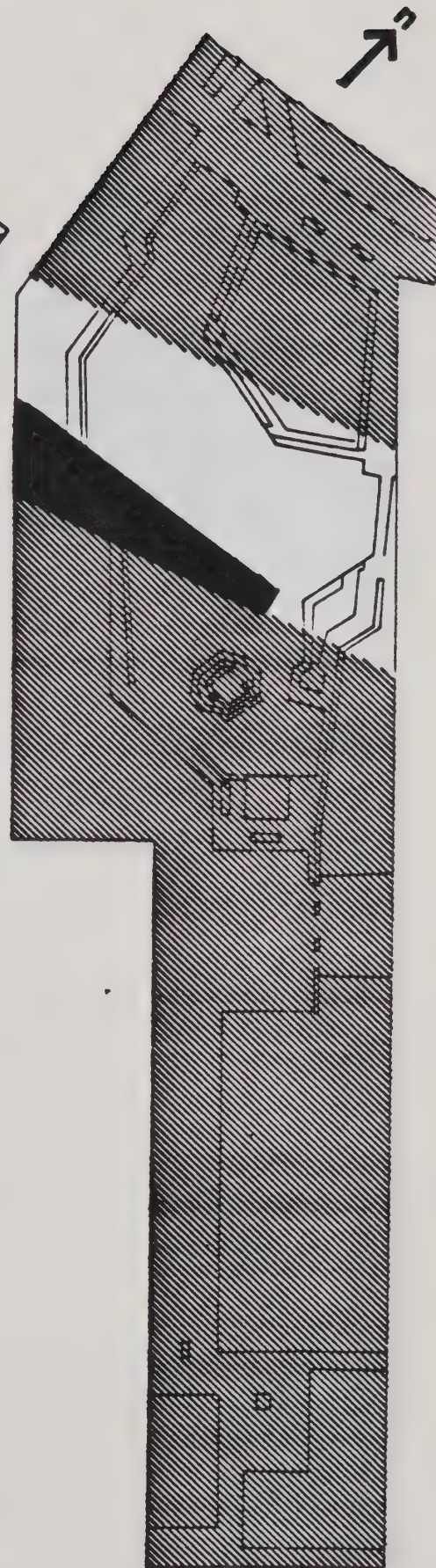
EXISTING SHADOW
MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



9/20 08:30



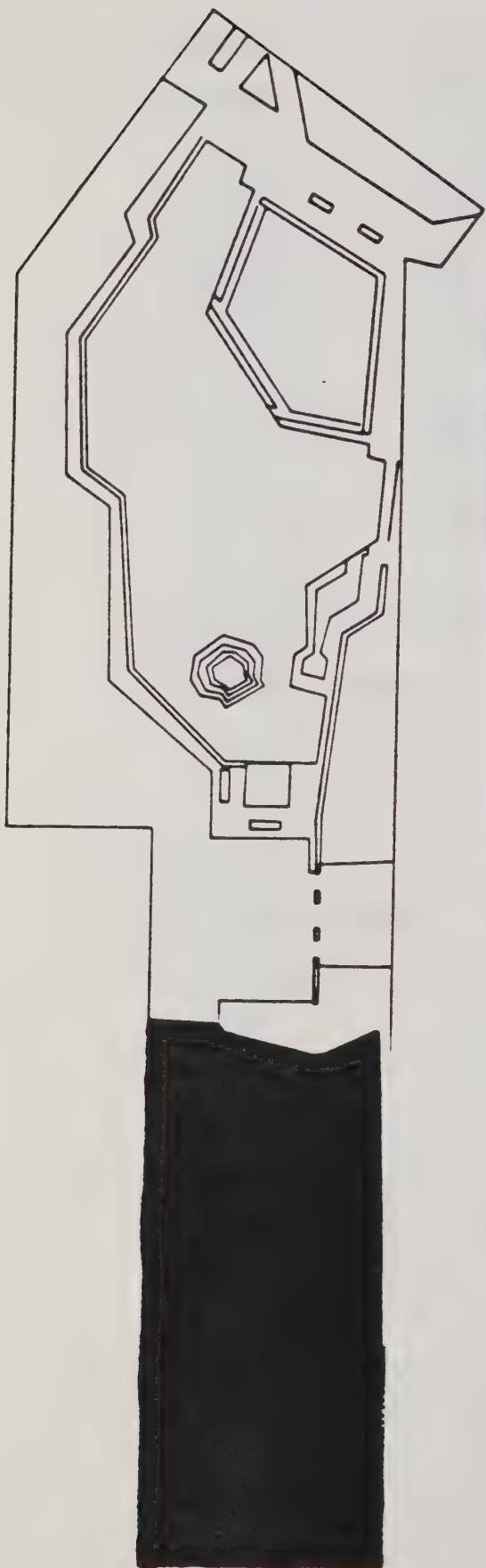
9/20 12:00



9/20 17:15
Scale: 1" = 100'

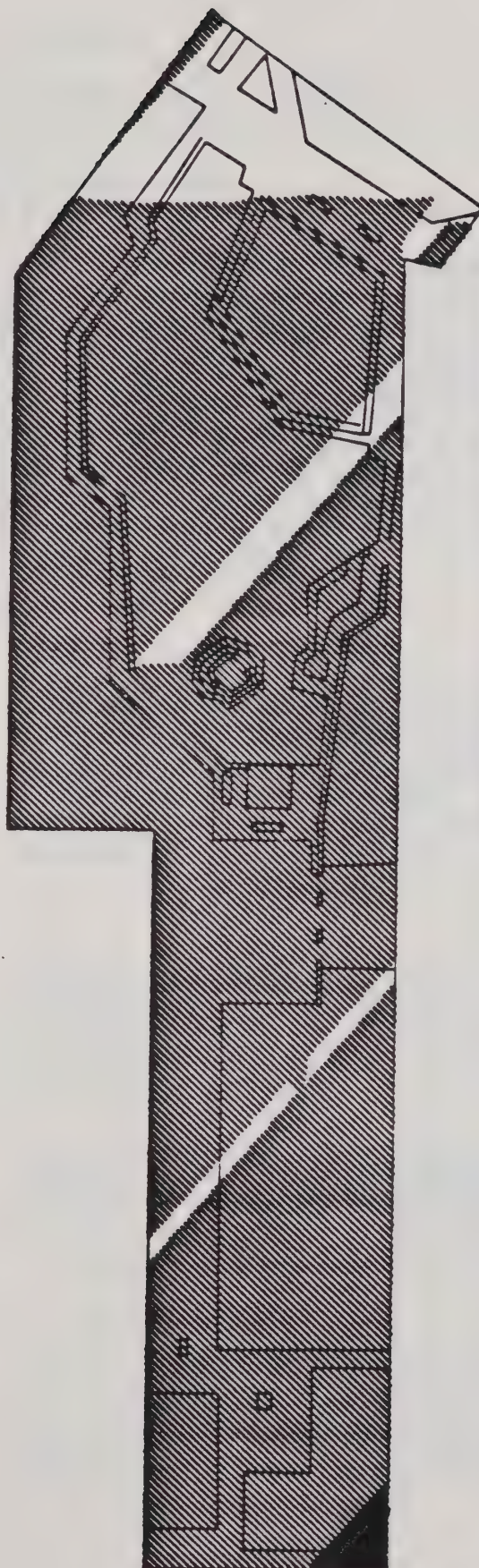
EMBARCADERO CENTER 2

EXISTING SHADOW
MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED

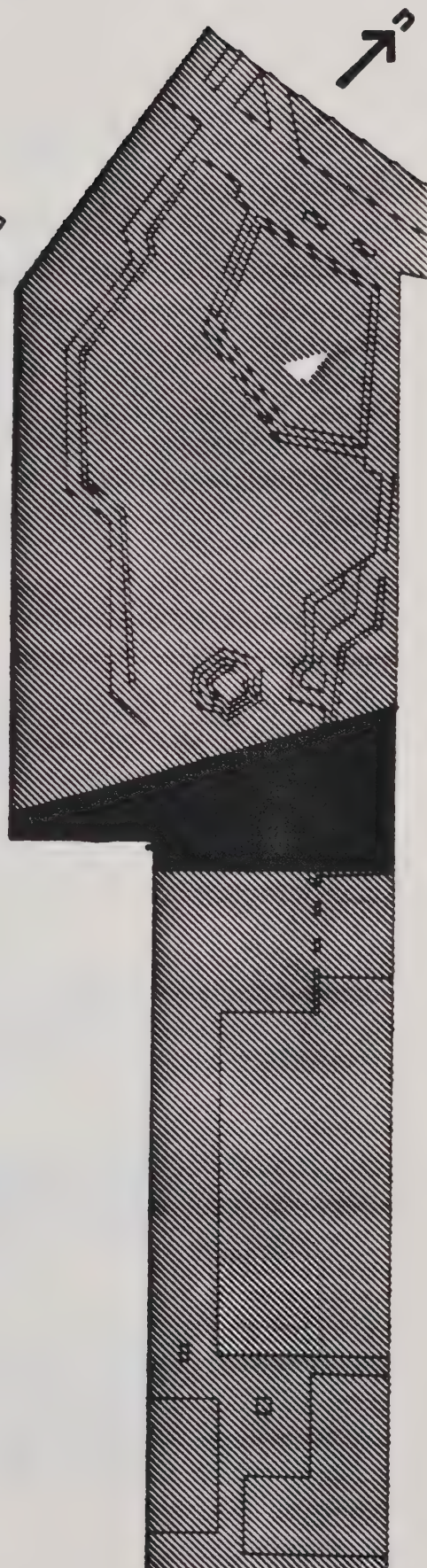


12/20 09:00

EMBARCADERO CENTER 2





12/20 12:00



12/20 14:15

Scale: 1" = 100'

 EXISTING SHADOW
 MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



PARK NAME: Union Square

LOCATION: Geary, Post, Powell, Stockton
Located in the center of the City's retail district.

SIZE: 105,515 square feet
This park ranks as the third largest Downtown park.

CHARACTERISTICS: The park is surrounded by tall buildings to the east, west and the south. This relatively flat formal park is slightly elevated from the surrounding streets. Features include park furniture for sitting and lawn areas. The greatest intensity of park use occurs during mid-day hours. Users are downtown workers, shoppers, tourists. Many pedestrians use the park as a mid-block crossing. This park is the location for many civic demonstrations and cultural activities. Union Square is near the Powell Street cable car line and major hotels. A parking facility is located beneath the park.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: 38.3% of the total year round sunshine is used up by existing shadows. The shadow profile for this park is generally a "U" shaped shadow distribution with significant shadows in the morning and even greater shadows in the afternoon hours. The "U" shaped distribution is increasingly flat in the Winter due to increased mid-day shadows.

Seasonal Shadow:

- **Summer:** Least shadow impacts - greatest sun resource. Shadowed in early morning and late afternoon with relatively more shadow during the afternoon hours. Approximately 30% of the sun resource is in shadows at the time of the Summer Solstice.
- **Spring/Fall:** Major shadow impacts during the early morning and late afternoon hours. Morning shadows increase as Fall approaches. The least shadow impacts occur between 9:30 AM and 2:30 PM. During Equinox approximately 35% of the park sun resource is in shade.
- **Winter:** The greatest shadow impacts on Union Square occur during the Winter months. In Winter, nearly 50% of the park is in shadow for the entire day. There is very little sunlight available before 9:30 AM and after 2:30 PM during the winter. The Winter Solstice conditions are such that 60% of the park sun resource is in shadow.

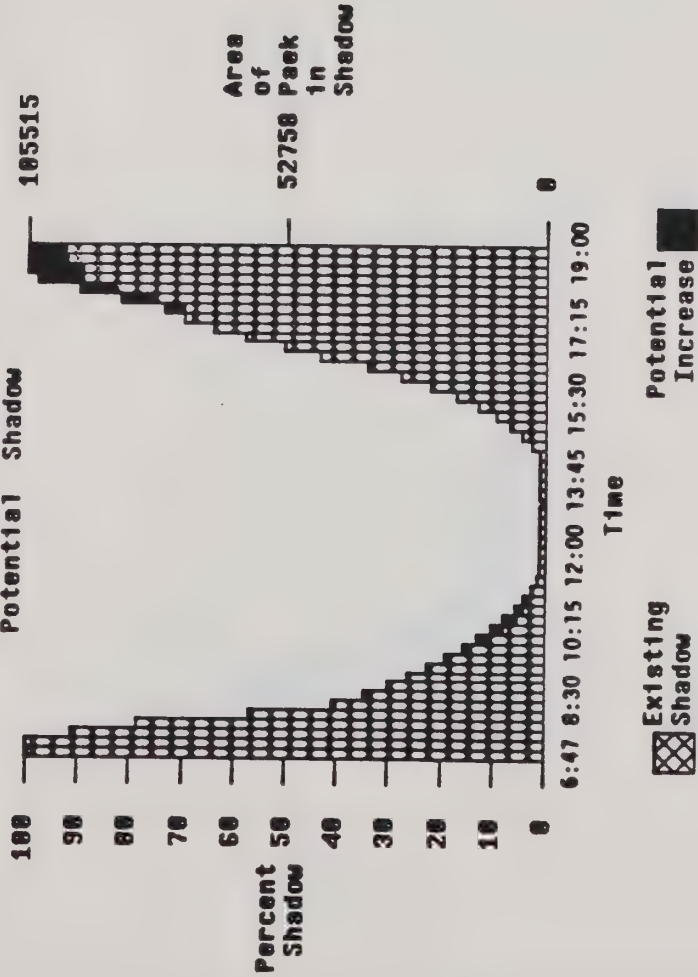
HISTO

Parameters Histogram Exit

Union Square

June 21, 1987

Potential Shadow

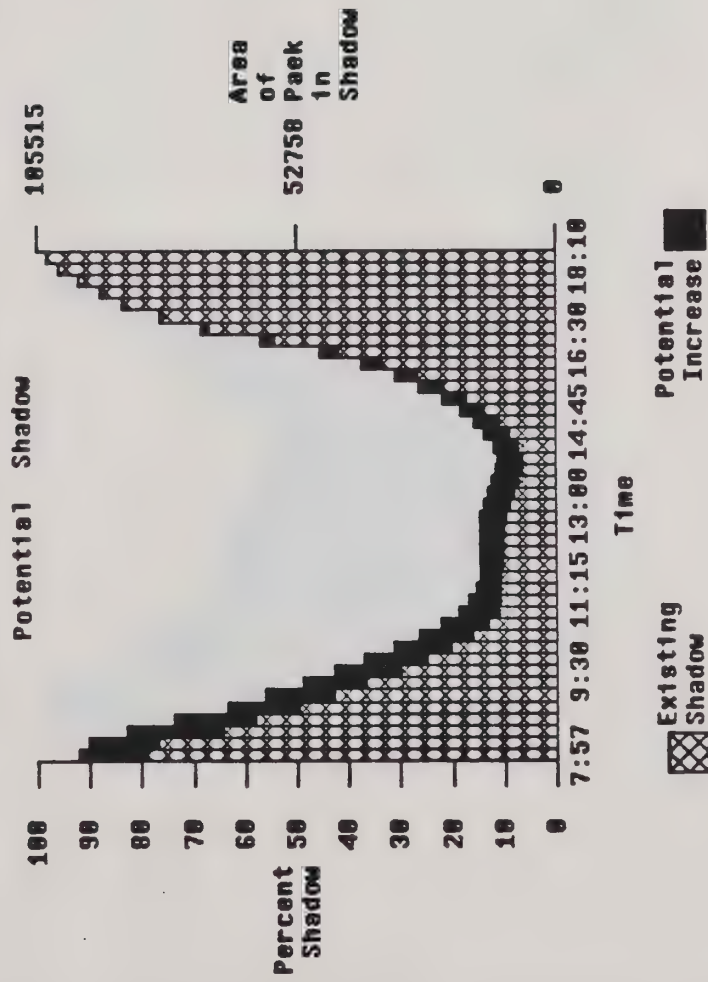


HISTO

Parameters Histogram Exit

Union Square

September 28, 1987 (March)

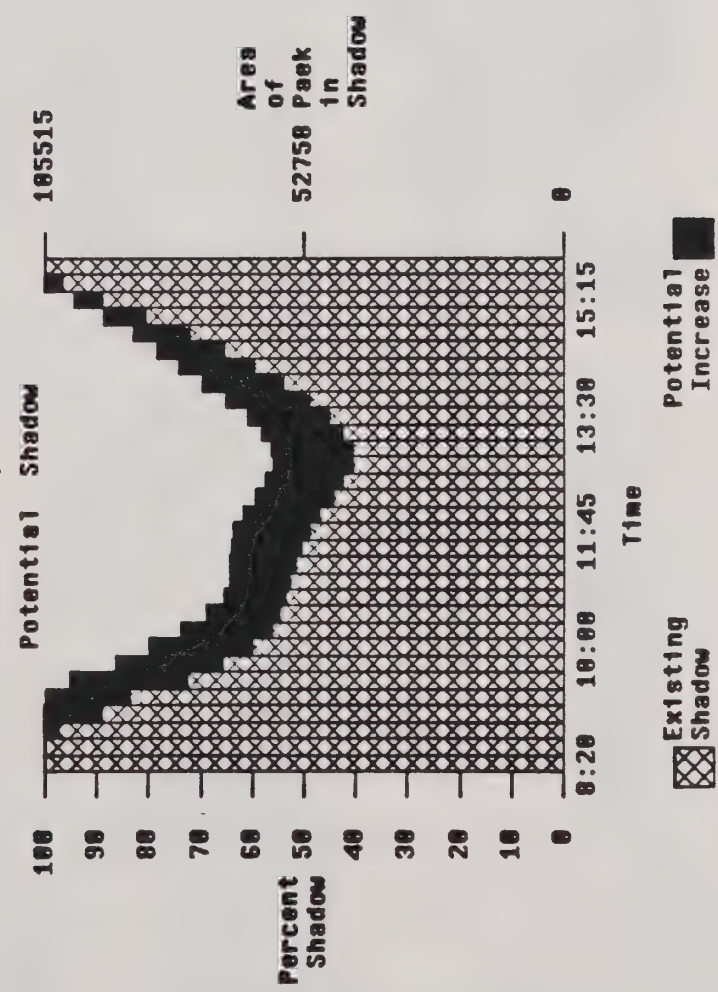


HISTO

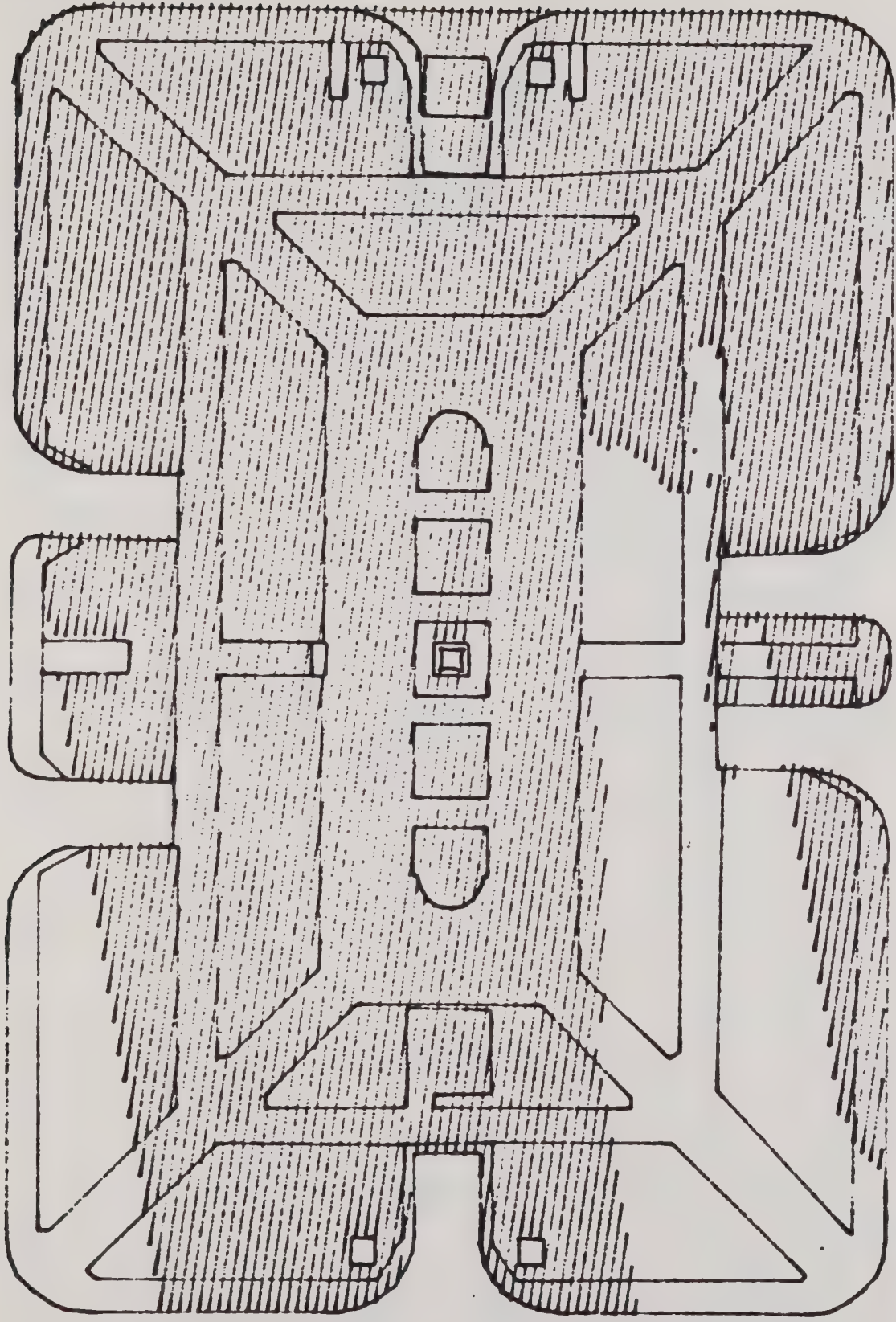
Parameters Histogram Exit

Union Square

December 28, 1987



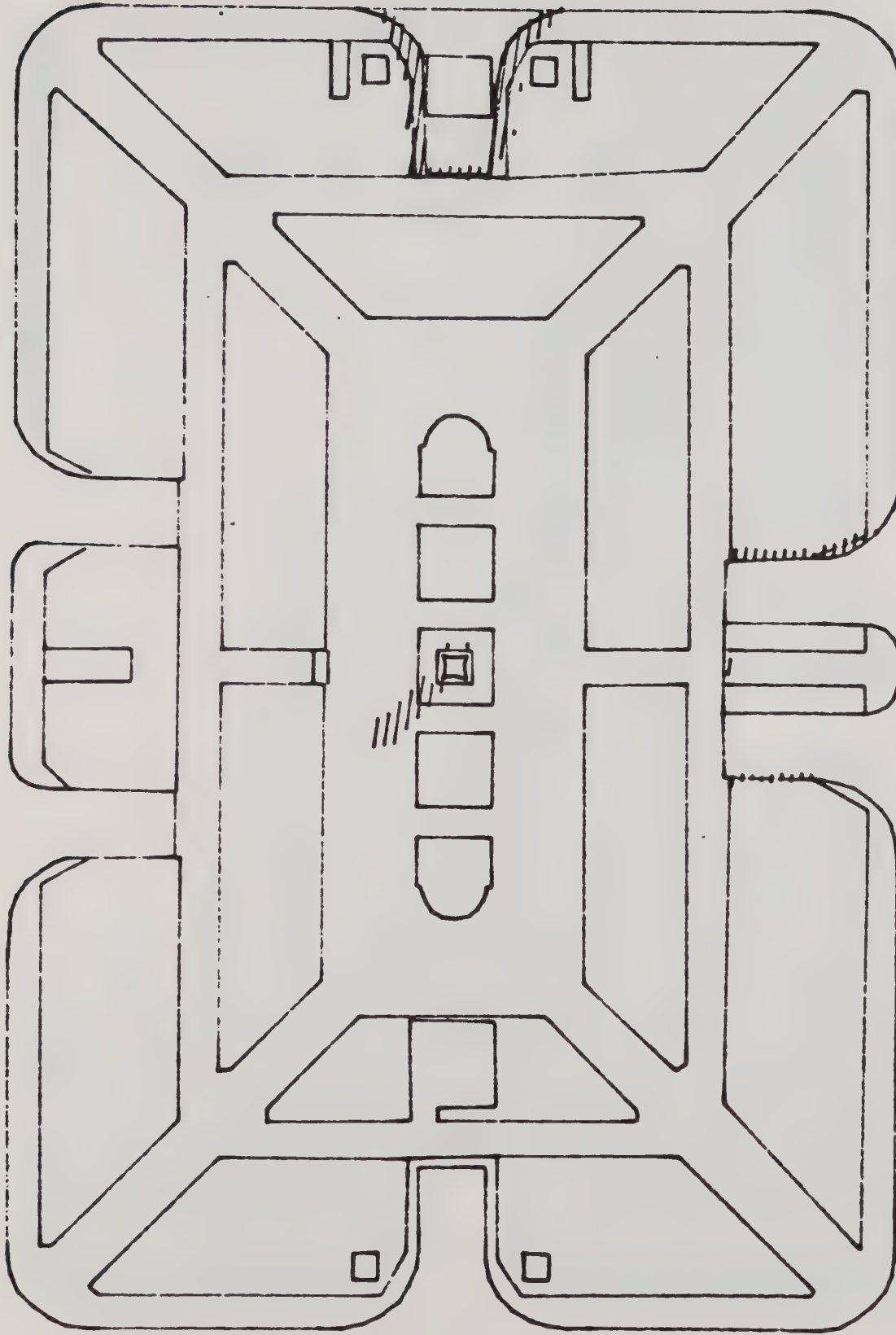




EXISTING SHADOW
SHADOW IF NO LIMIT IS
IMPOSED

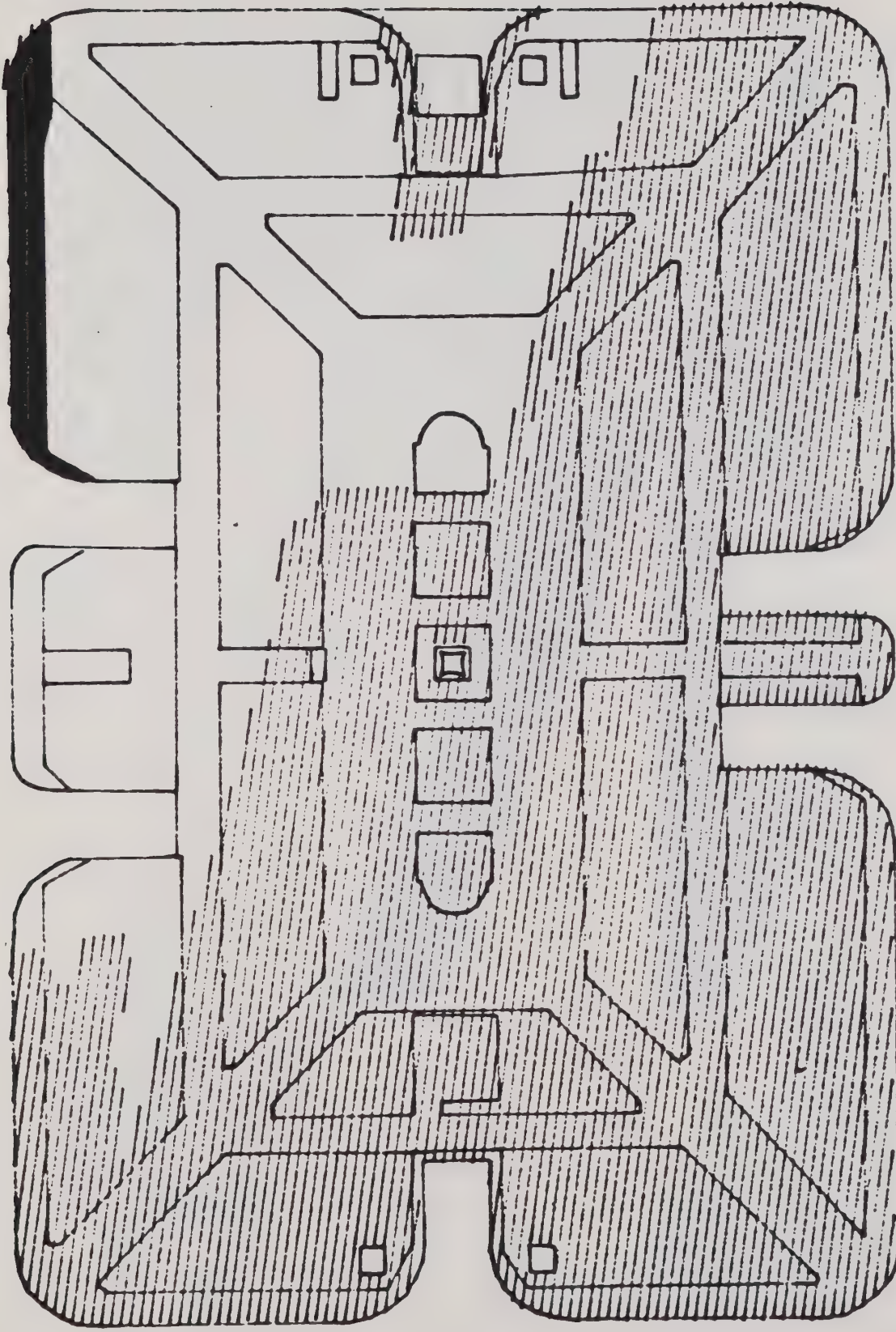
6/21 07:30
Scale: 1" = 50'
UNION SQUARE





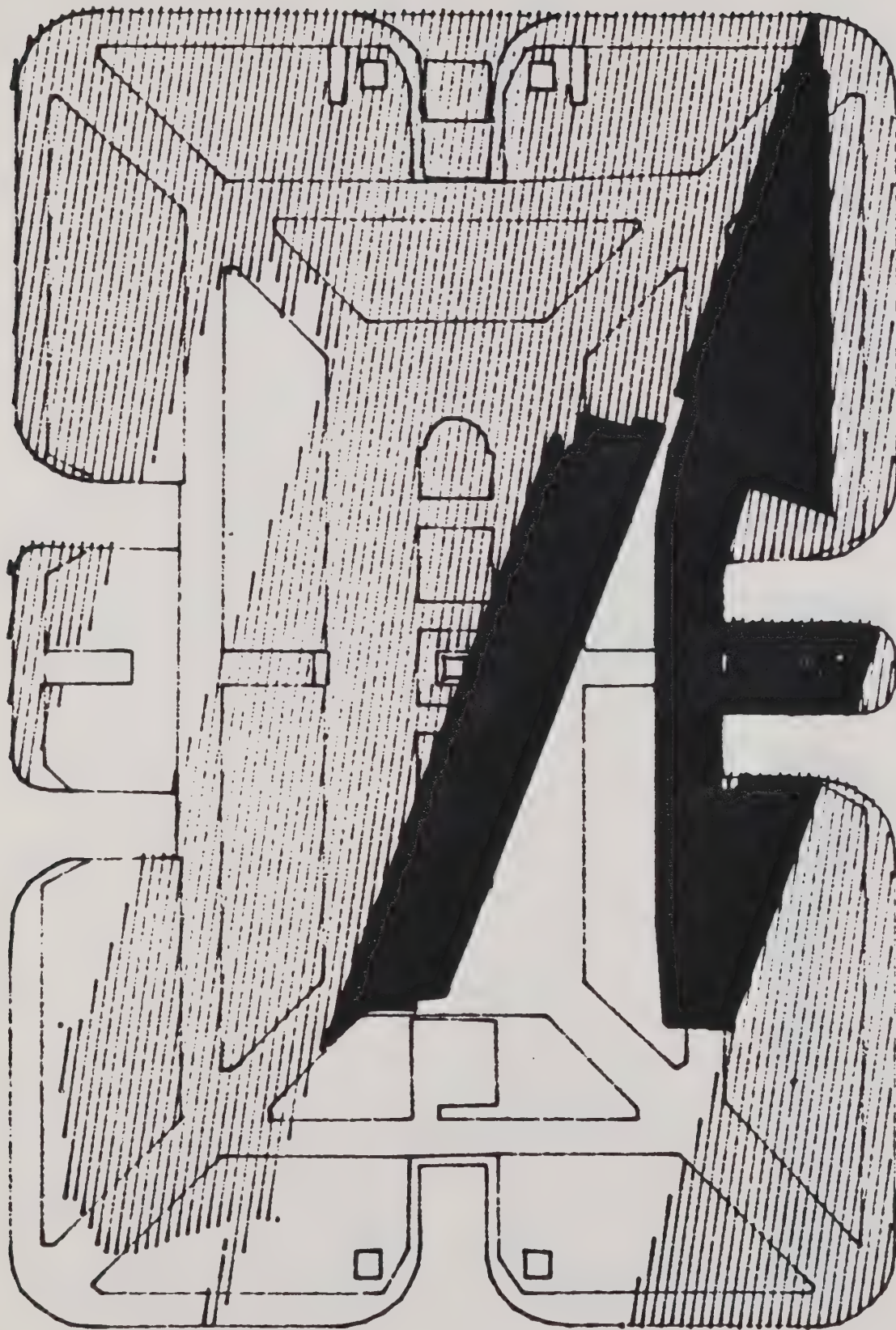
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MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 12:00
Scale: 1" = 50'
UNION SQUARE



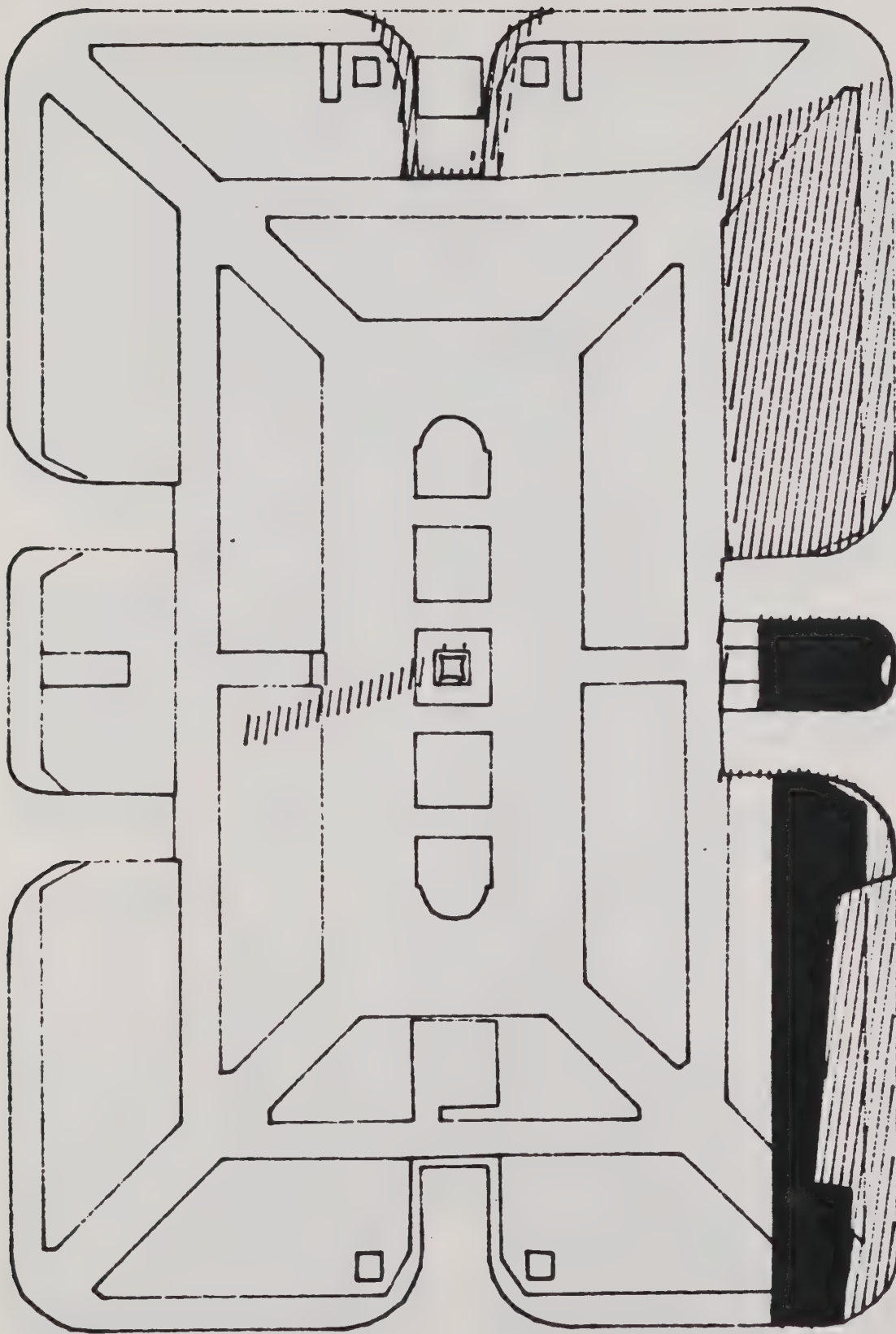
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SHADOW IF NO LIMIT IS
IMPOSED

6/21 16:00
Scale: 1" = 50'
UNION SQUARE



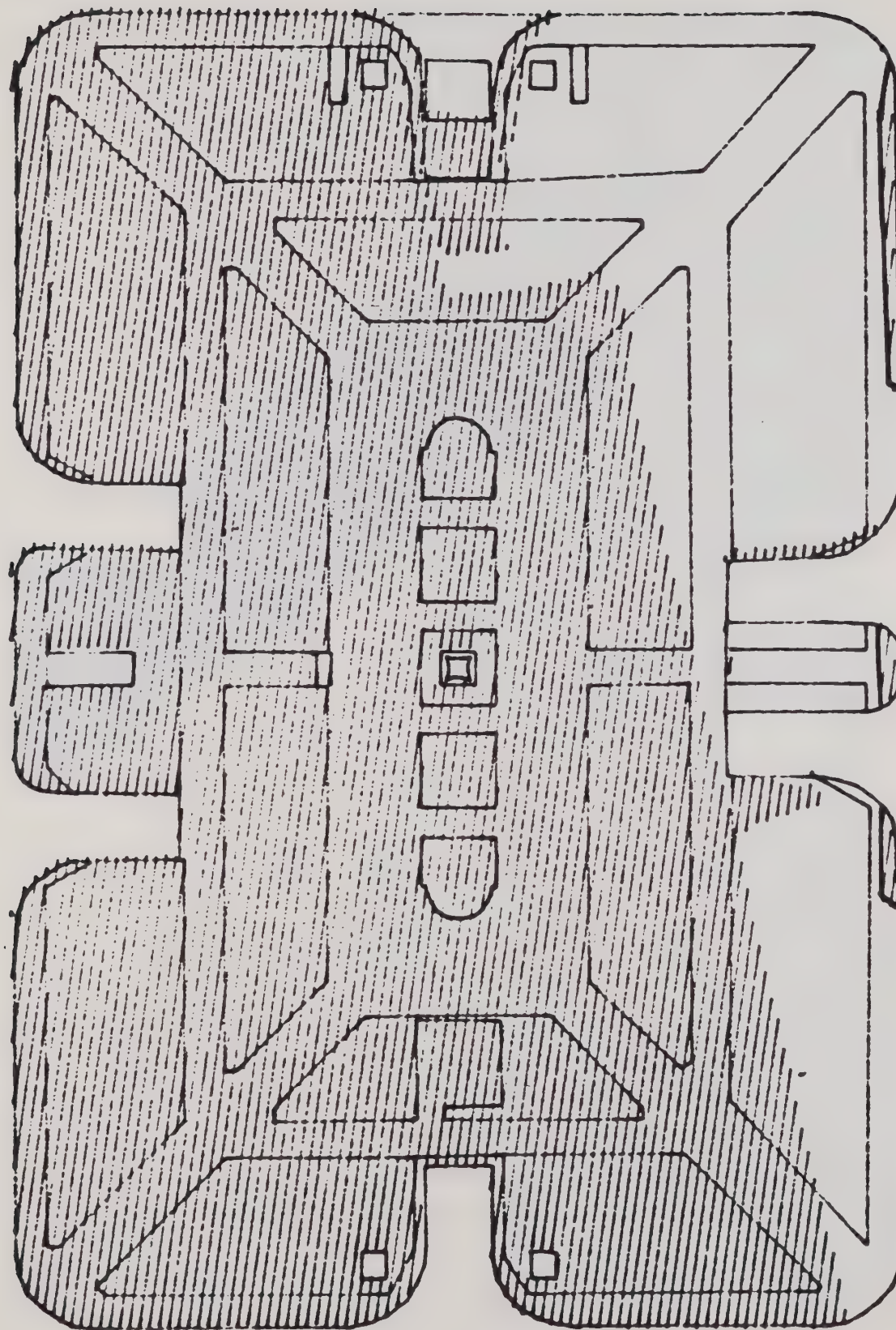
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 08:30
Scale: 1" = 50'
UNION SQUARE



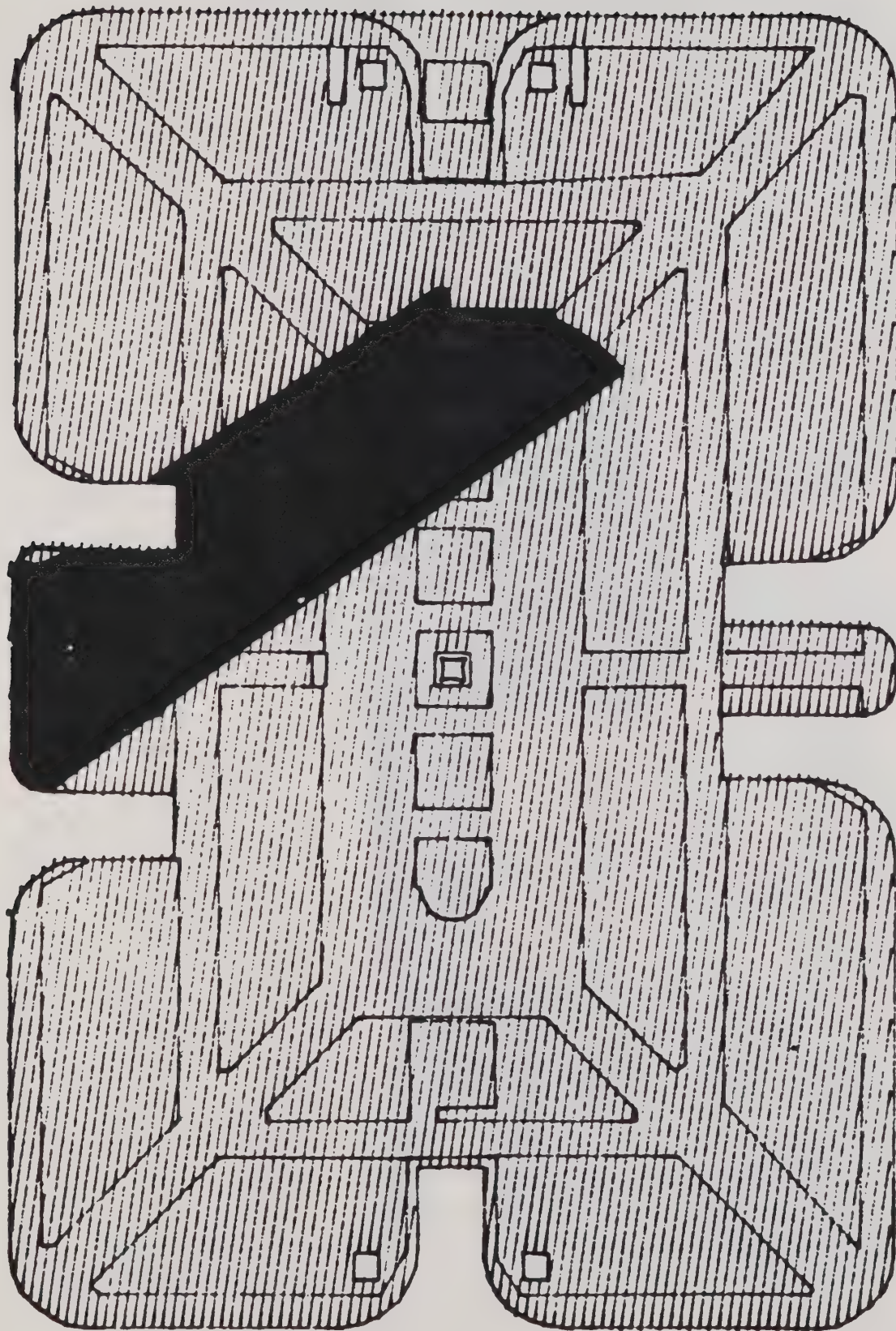
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 12:00
Scale: 1" = 50'
UNION SQUARE



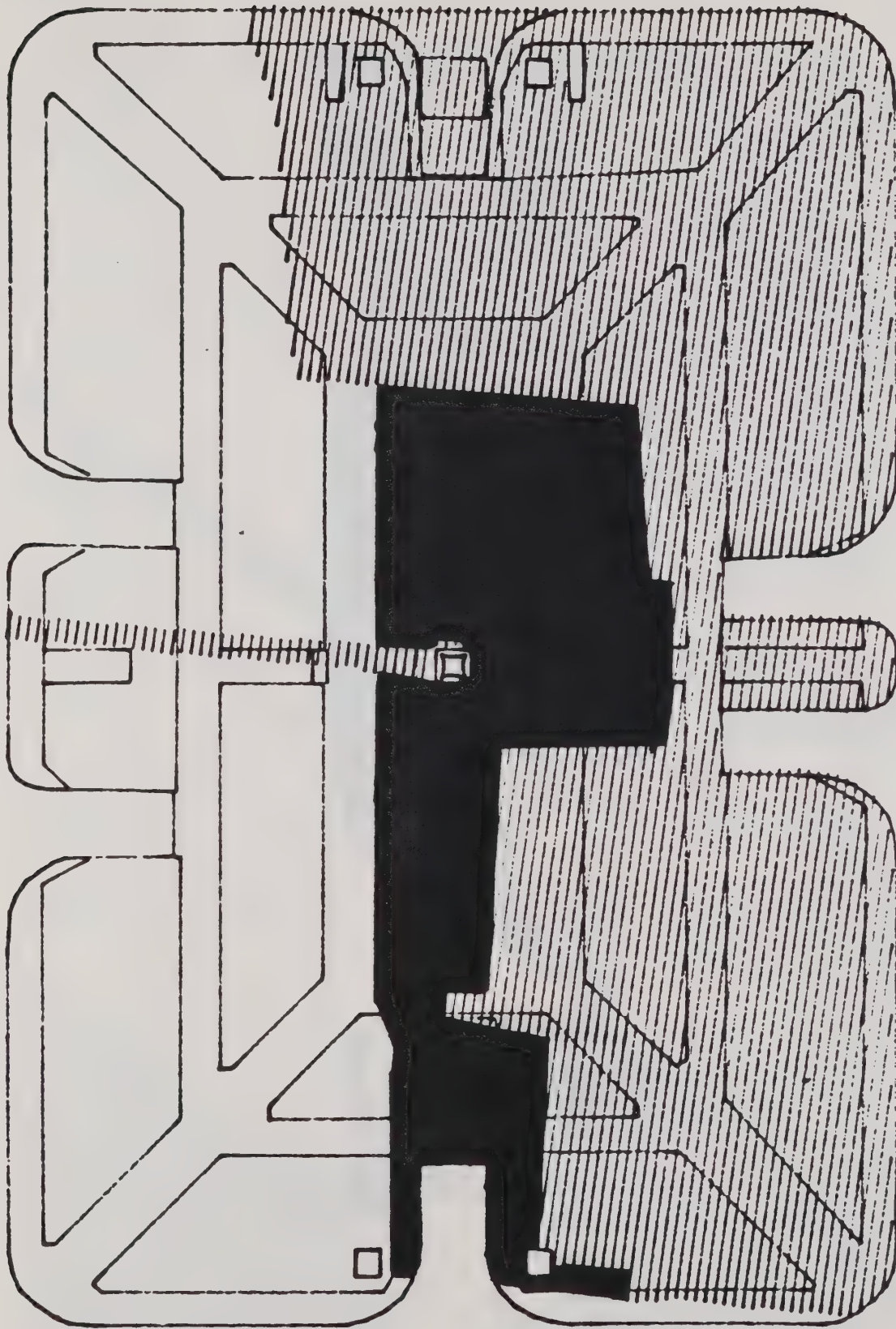
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 11:00
Scale: 1" = 50'
UNION SQUARE



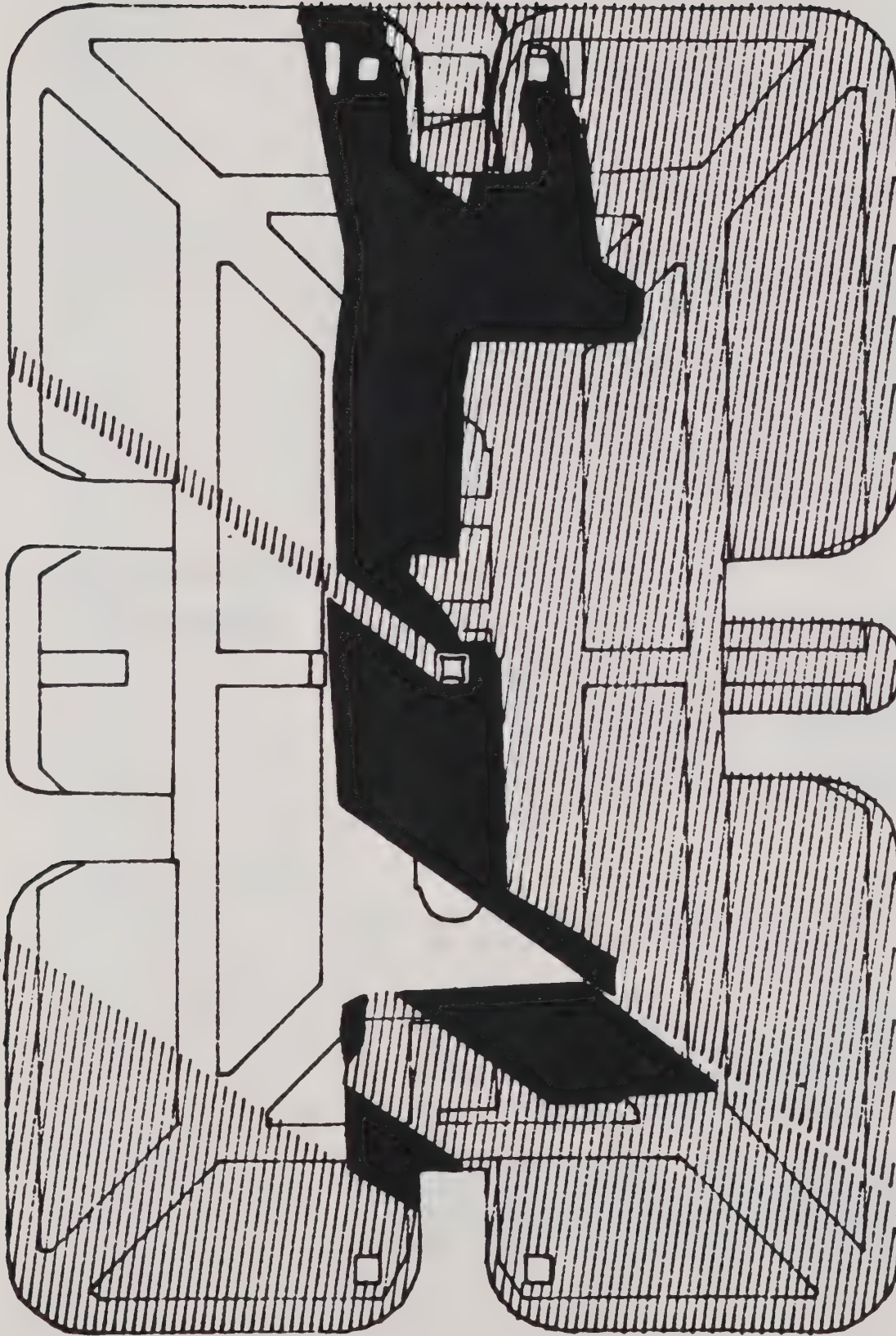
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

12/20 09:00
Scale: 1" = 50'
UNION SQUARE



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

12/20 12:00
Scale: 1" = 50'
UNION SQUARE



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

12/20 14:00
Scale: 1" = 50'
UNION SQUARE

PARK NAME: Washington Square

LOCATION: Union, Powell, Filbert & Stockton
It is located in a neighborhood commercial district of the North Beach area.

SIZE: 98,991 square feet
Washington Square is the fourth largest downtown park.

CHARACTERISTICS: Buildings surrounding the open space are between one and four stories in height which permits a great deal of sunshine in the park. The park contains a children's playground in the north-west section, a large lawn area and seating furniture along walkways. Users of the park are primarily children and elderly neighborhood residents. This flat park also contains a separate and isolated section in the intersection of Powell, Union and Columbus. Due to the separation from the remainder of the park and the vegetation on the isolated section, it is not heavily used.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: In general this park is very sunny year round - 5.8% of the annual sun resource is currently in shadow. From March through September the shadow profile distribution is a relatively flat "U" shape with minimal shadows in the morning and afternoon and no mid-day shadows. Between October and February the "U" shape is increasingly steep due to increased morning and afternoon shadows.

Seasonal Shadow:

- **Summer:** There are almost no shadows in the park between 9am and 6pm. 5% shaded during Summer Solstice.
- **Spring/Fall:** As in Summer, there are relatively small shadow impacts on the park between 9am and 6pm. Toward the end of Fall and in early Spring during the afternoon there are increasing shadows cast by the hills and buildings to the West. 5% shaded during the Equinox.
- **Winter:** Shadows increase overall during the Winter months. No more than 10% of the park is shaded between the hours of 9am and 4pm and the afternoon shadows continue to increase. 15% shaded during the Winter Solstice.

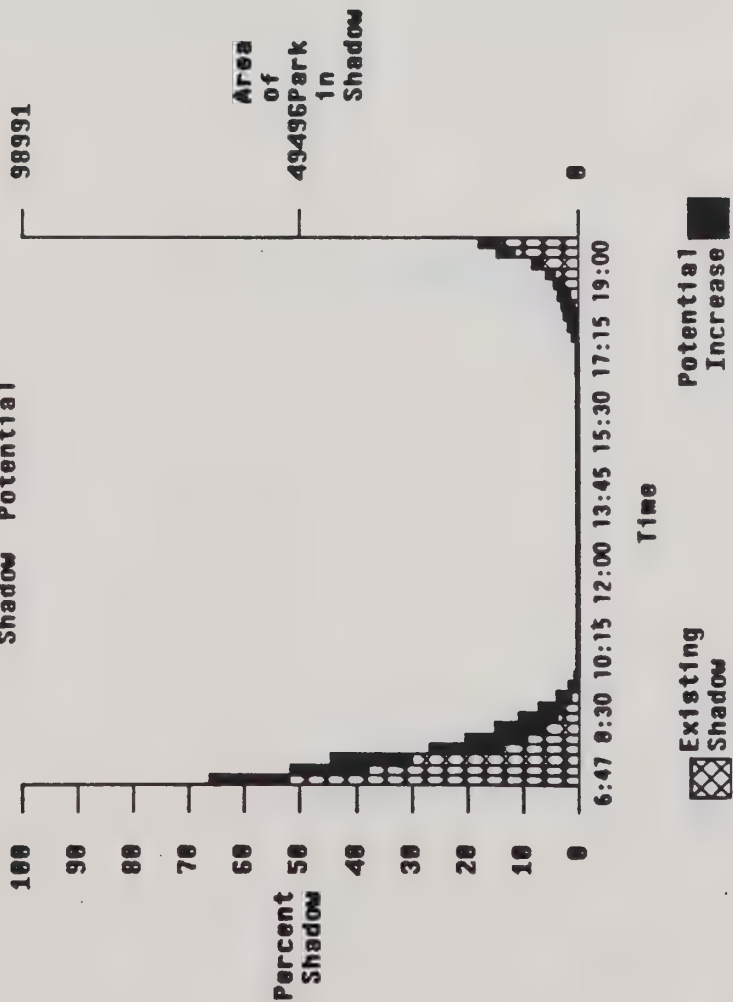
HISTO

Parameters Histogram Exit

Washington Square

June 21 1987

Shadow Potential



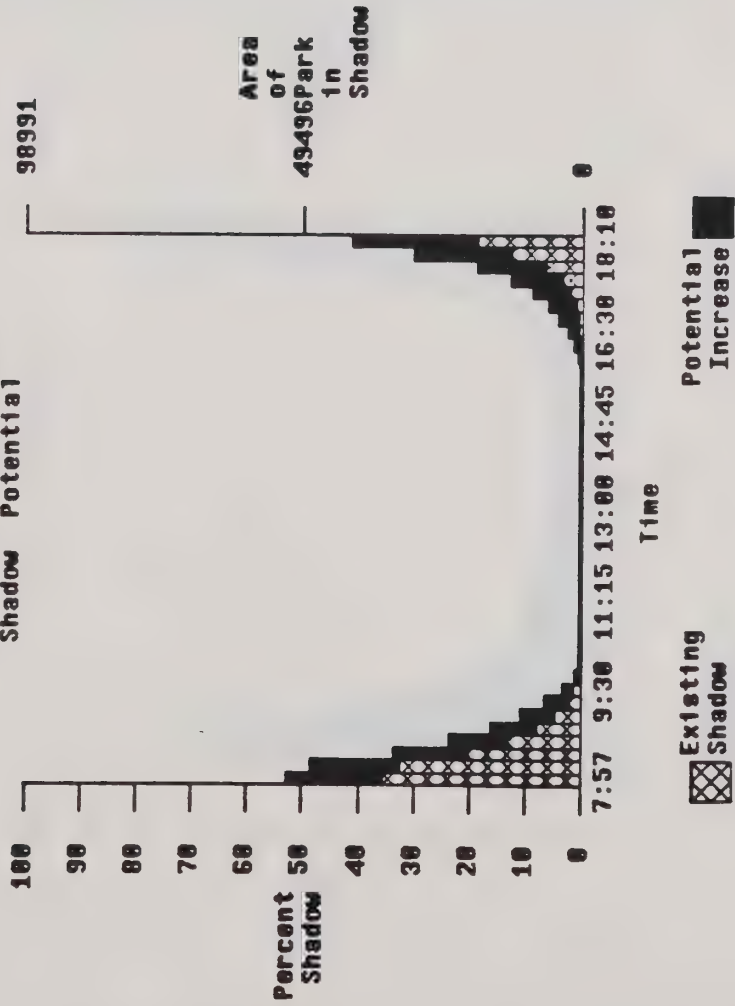
Parameters Histogram Exit

HISTO

Washington Square

September 20 1987

Shadow Potential



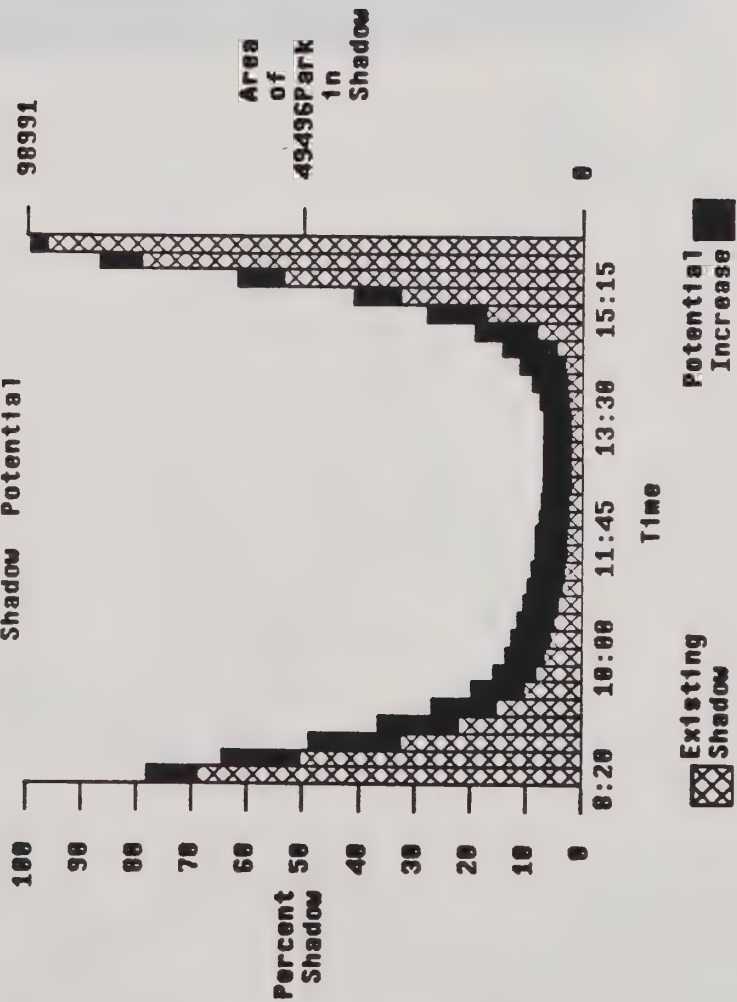
HISTO

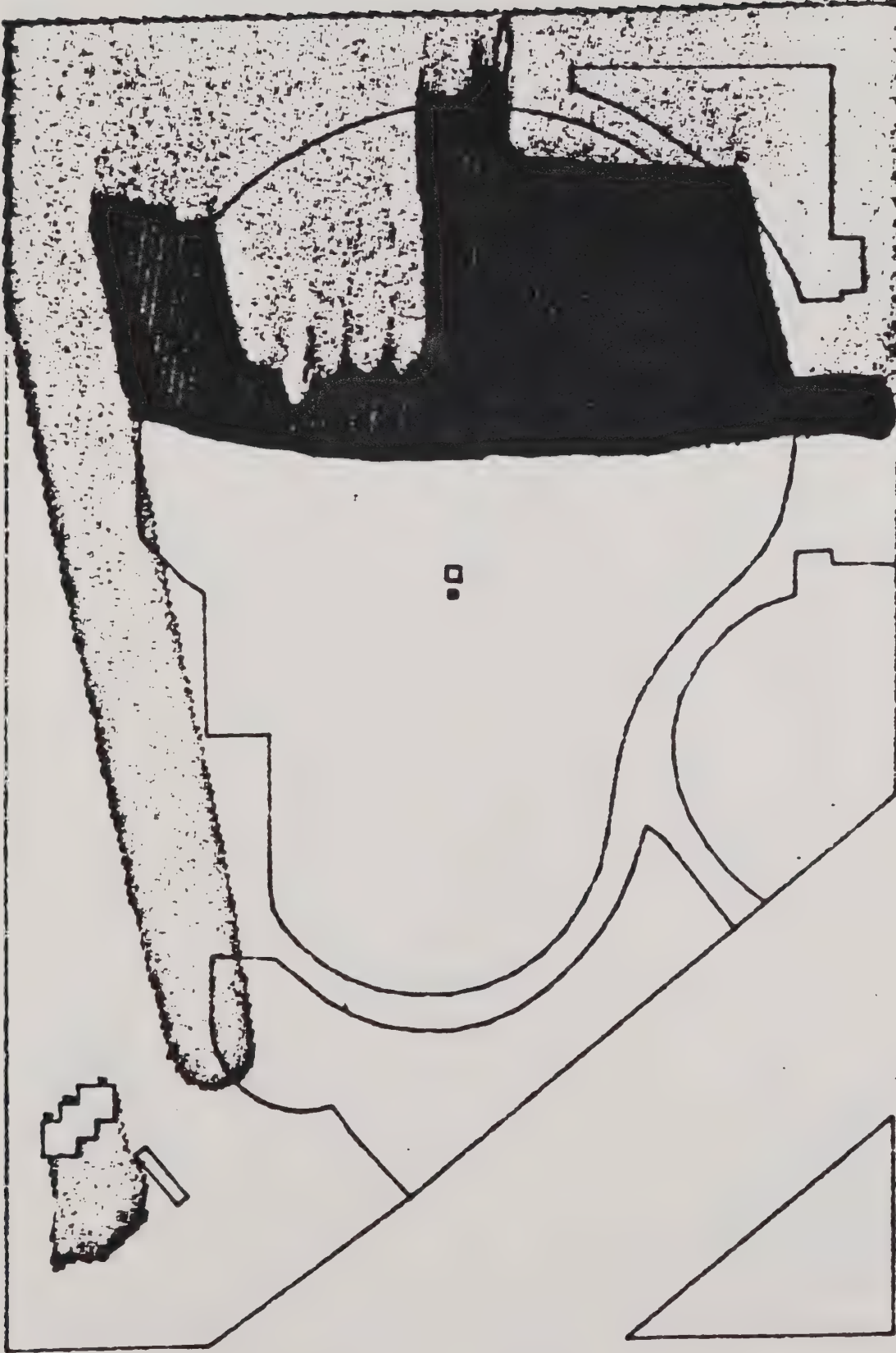
Parameters Histogram Exit

Washington Square

December 20 1987

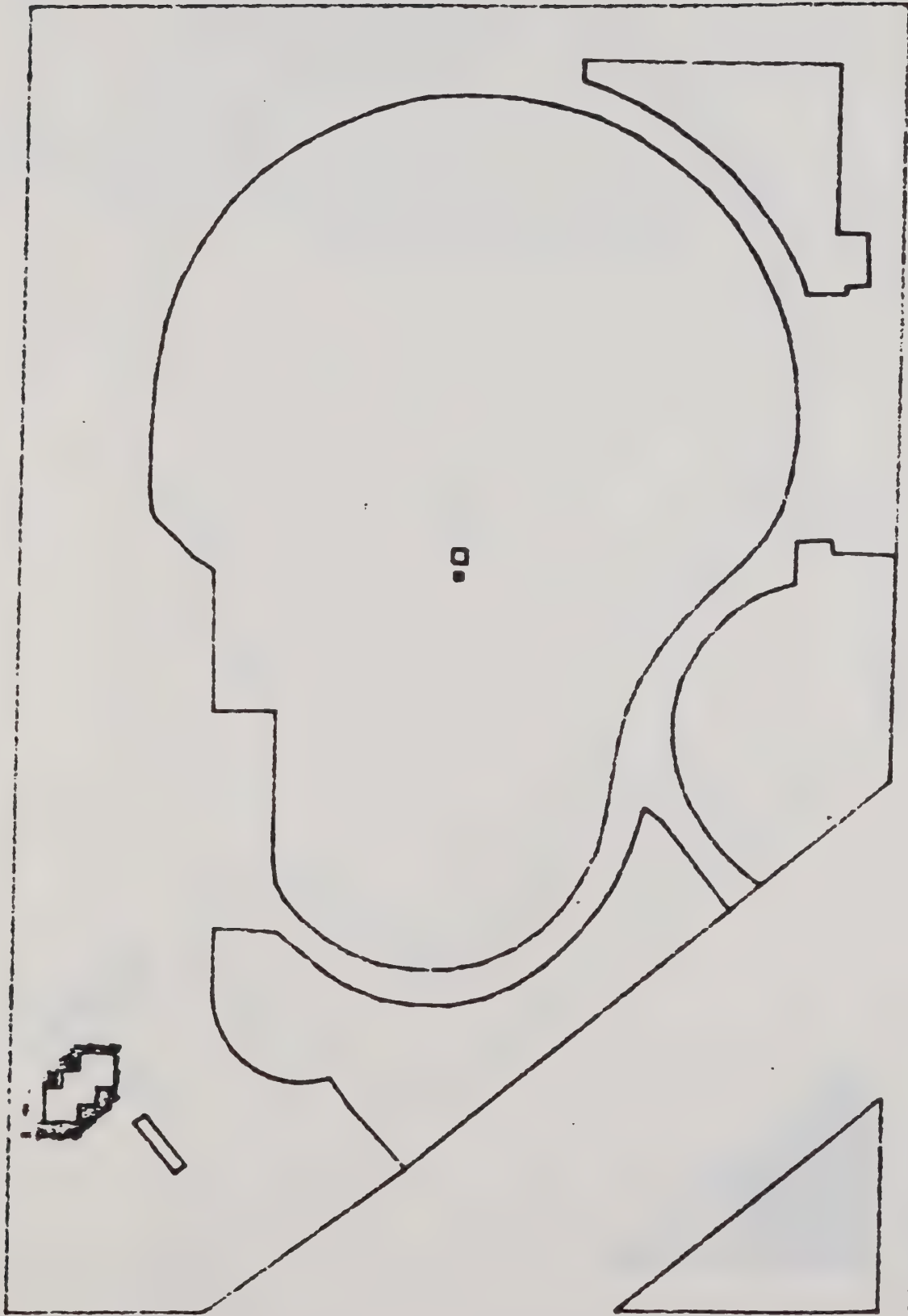
Shadow Potential





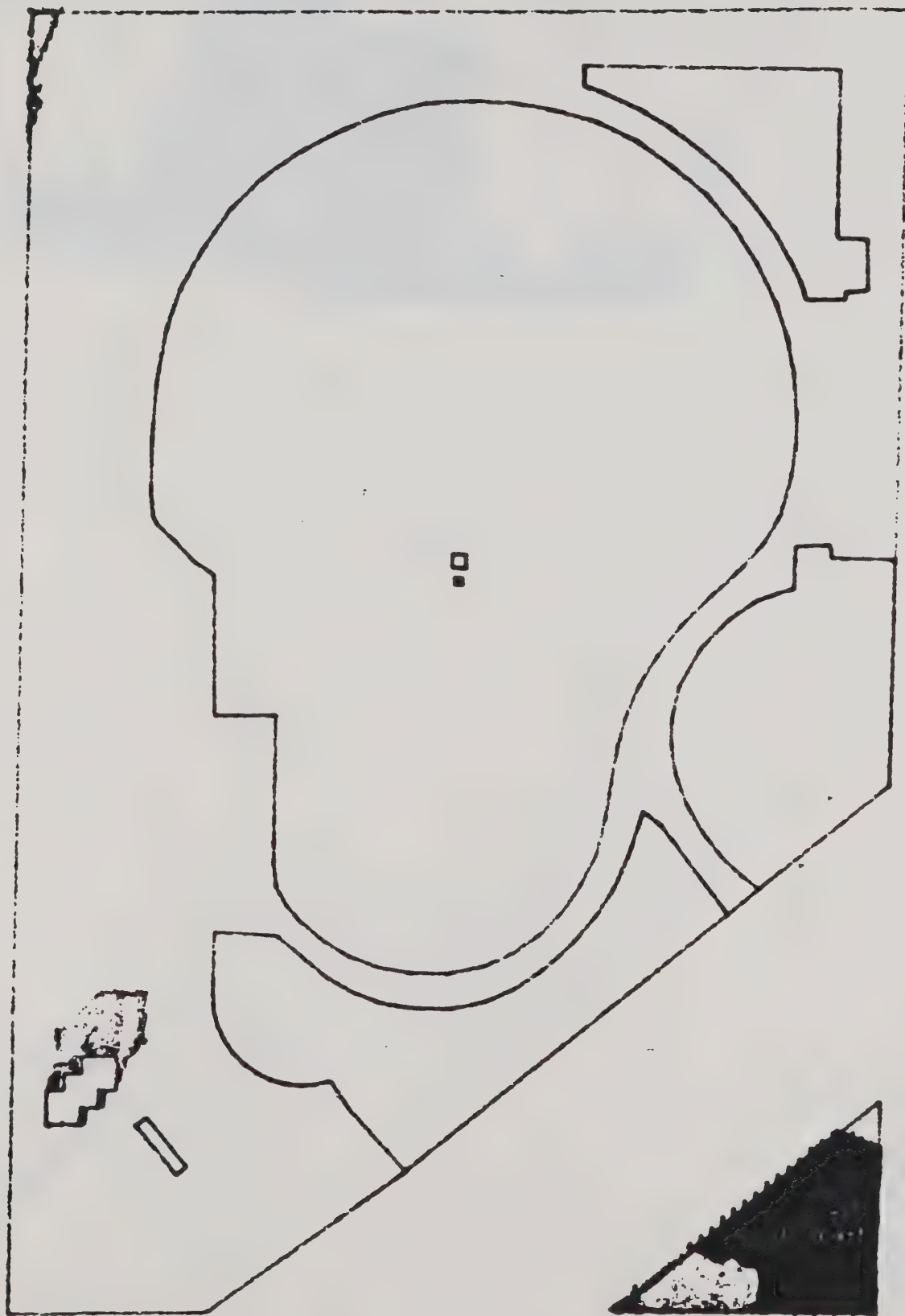
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 07:15
Scale: 1" = 50'
WASHINGTON SQUARE



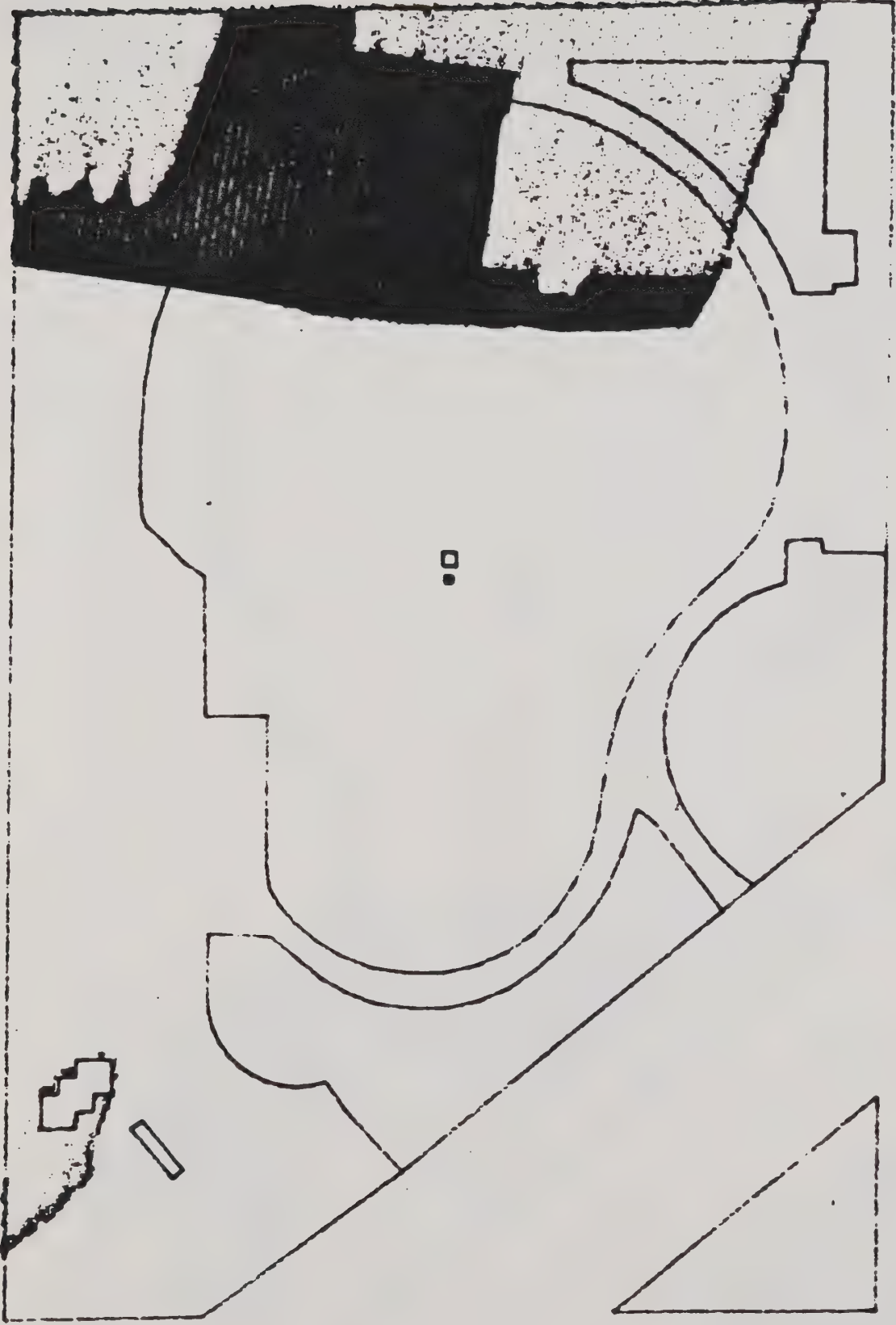
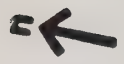
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MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 12:00
Scale: 1" = 50'
WASHINGTON SQUARE



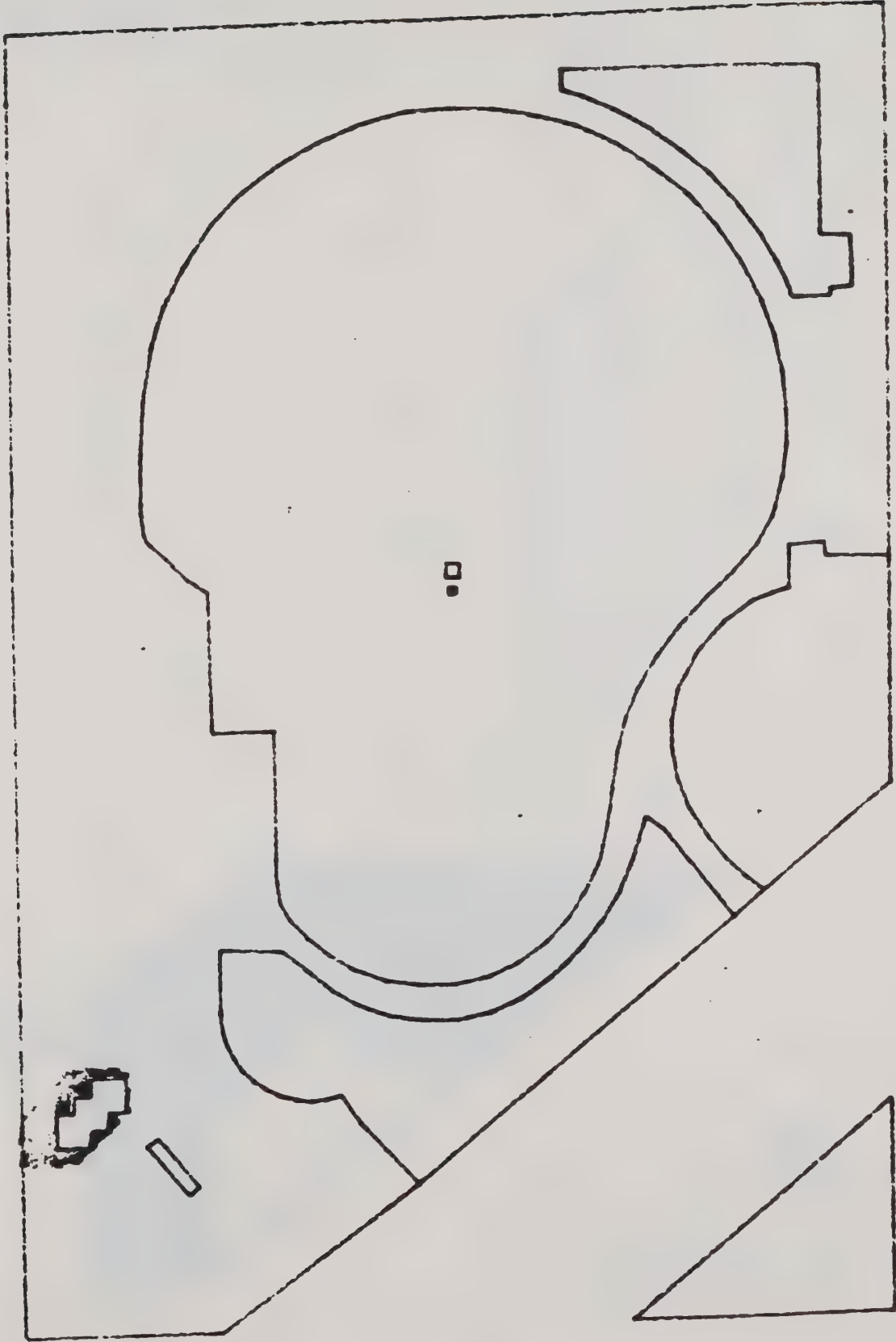
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MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 18:30
Scale: 1" = 50'
WASHINGTON SQUARE



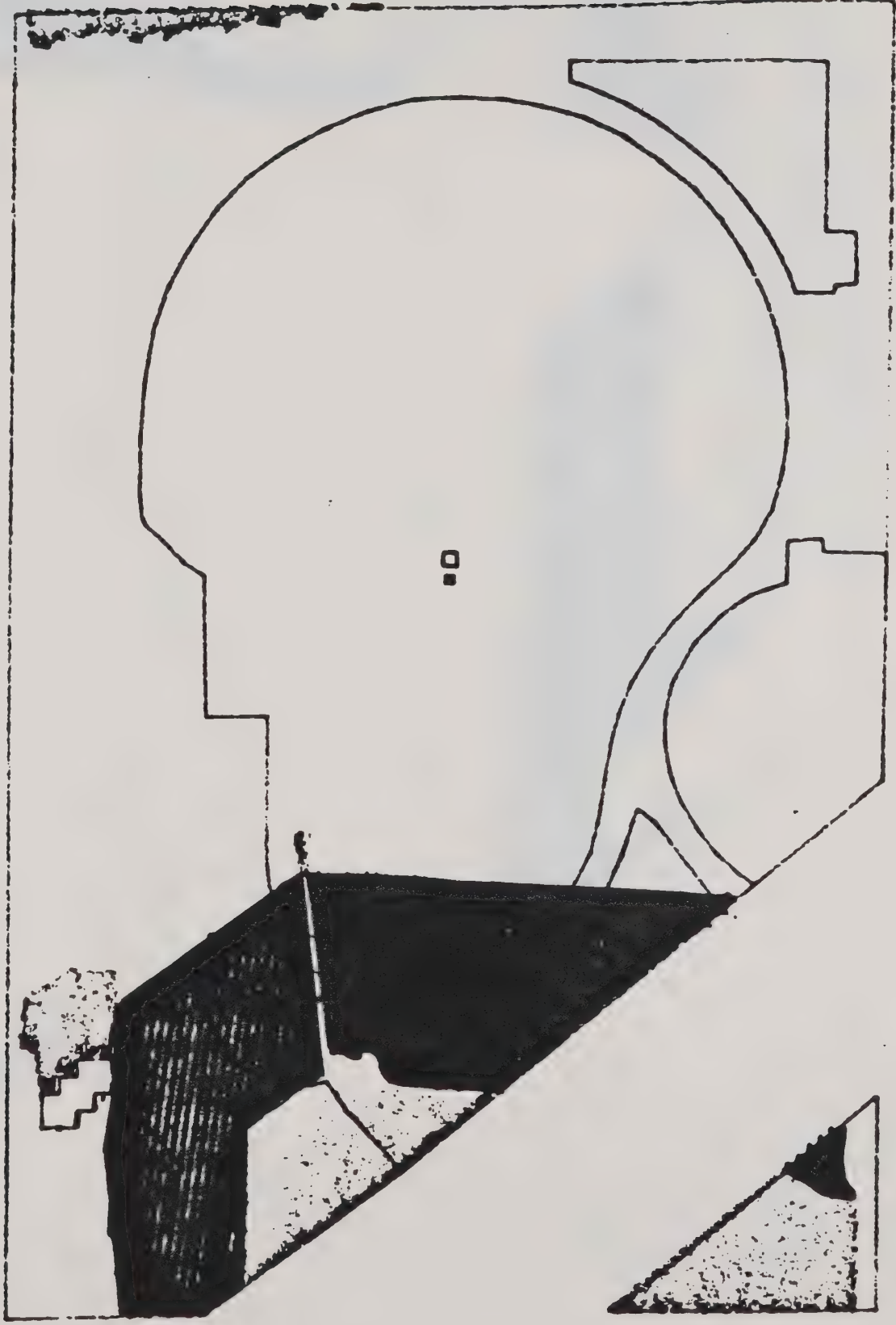
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 08:30
Scale: 1" = 50'
WASHINGTON SQUARE



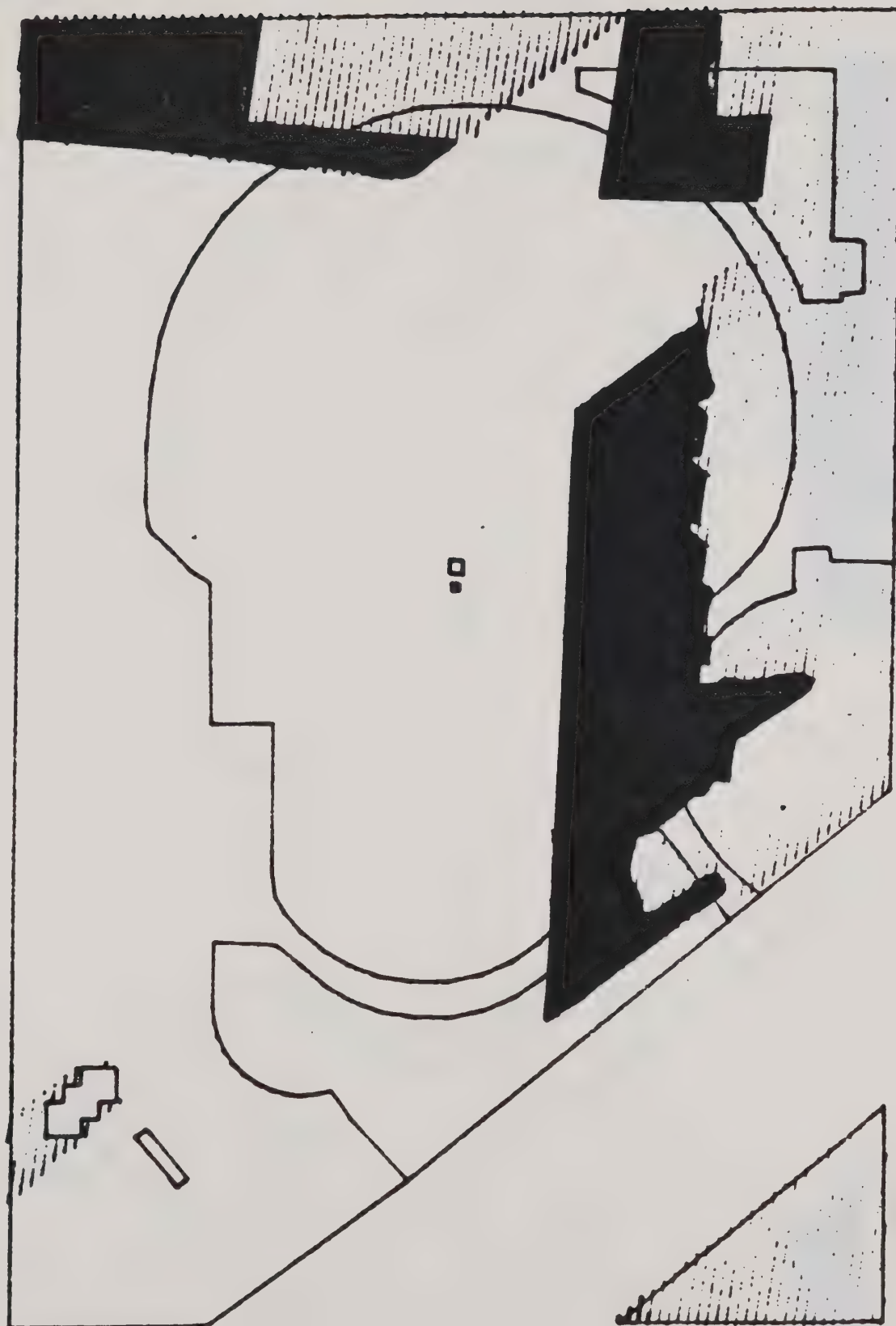
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 12:00
Scale: 1" = 50'
WASHINGTON SQUARE



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

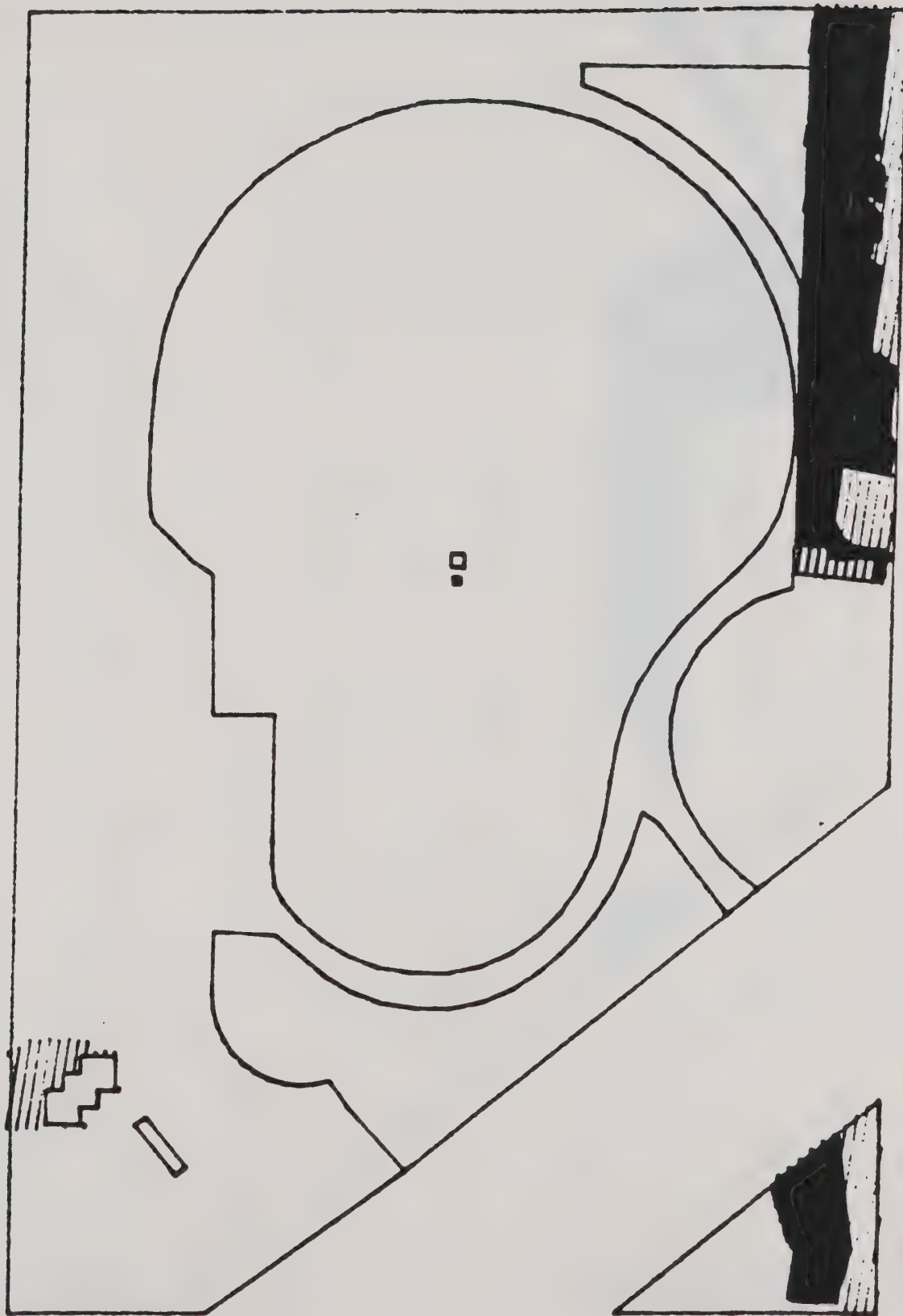
9/20 17:45
Scale: 1" = 50'
WASHINGTON SQUARE



WASHINGTON SQUARE

EXISTING SHADOW

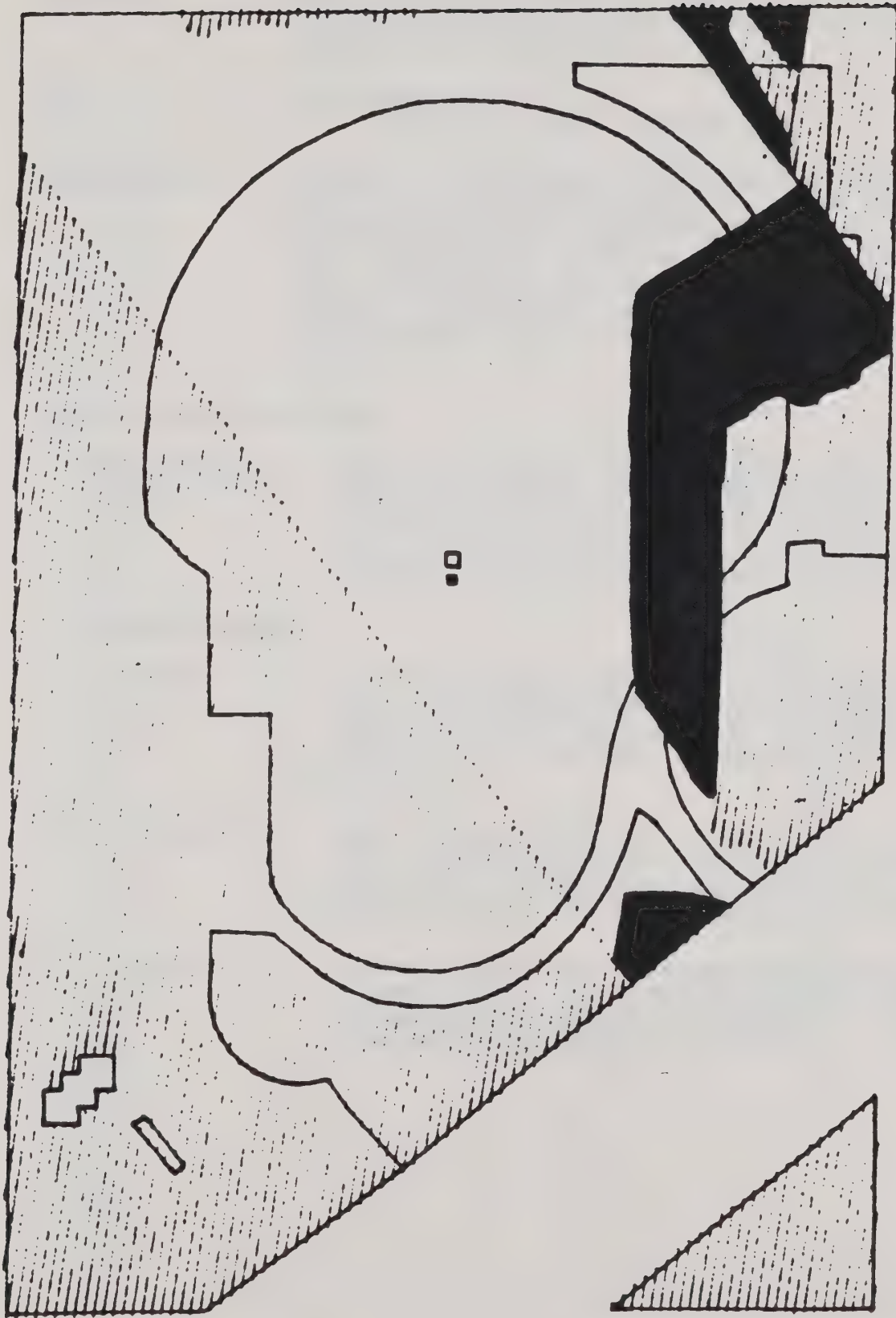
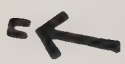
MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



12/20 12:00
Scale: 1" = 50'

WASHINGTON SQUARE

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



12/20 15:30
Scale: 1" = 50'

WASHINGTON SQUARE

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: North Beach Recreation Center

LOCATION: Powell, Mason, Greenwich & Lombard
The park is located in a mid rise residential and commercial use neighborhood.

SIZE: 94,930 square feet
This is the fifth largest Downtown park.

CHARACTERISTICS: The park is flat and has three large buildings on site. Other facilities include bacce ball, tennis courts, volleyball court and a children's playground in the South-west section. There are virtually no trees or lawn areas. Users of the park are primarily children and young athletes. The bacce ball courts are used by elderly residents and the court has a separate entrance off of Columbus.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: One of the sunniest downtown parks - 10.6% of the annual sun resource is currently in shadow. Throughout the year this park shadow profile curve is a relatively flat "U" with minimal shadows in the morning and afternoon and nearly full sun during the mid-day hours.

Seasonal Shadow:

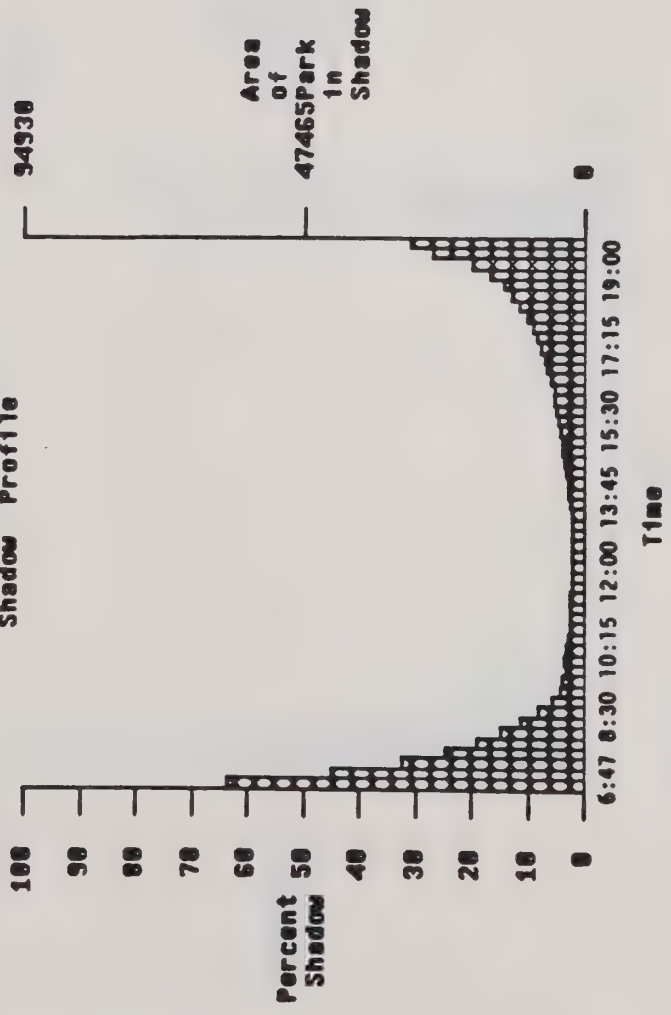
- **Summer:** In this park there almost no shadows between 8:30am and 7pm. Early morning shadows are greater than afternoon shadows and in the work shade of the season 45% of the park remains in the sun. 5% shaded during Summer Solstice.
- **Spring/Fall:** Summer shadow patters persist during Fall and Spring. Hills to the East and West increase the shadows on the park during late afternoon and early morning when Winter is near. 10% shaded during the Equinox.
- **Winter:** Shadow patterns remain the same with relatively more shadows overall. Early morning and late afternoon are the most heavily impacted shadow times. 15% shaded during Winter Solstice.

WISTO

Parameters Histogram Exit

North Beach Playground

June 21, 1987
Shadow Profile



Base Case

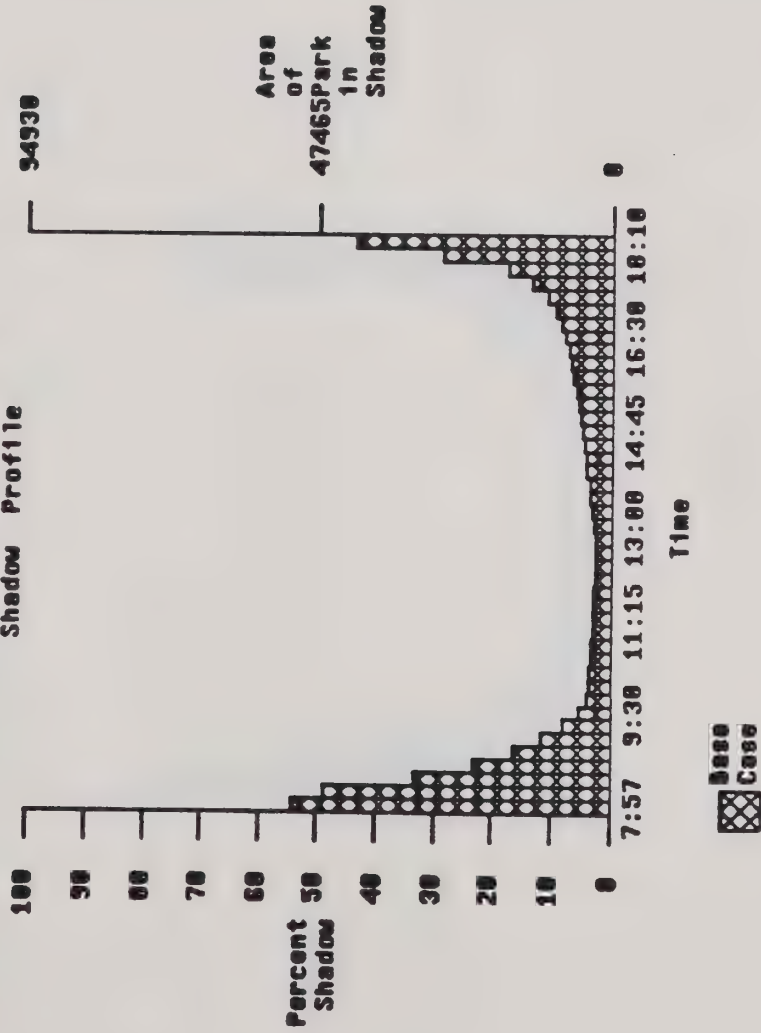
WISTO

Parameters Histogram Exit

North Beach Playground

September 28, 1987 (March)

Shadow Profile





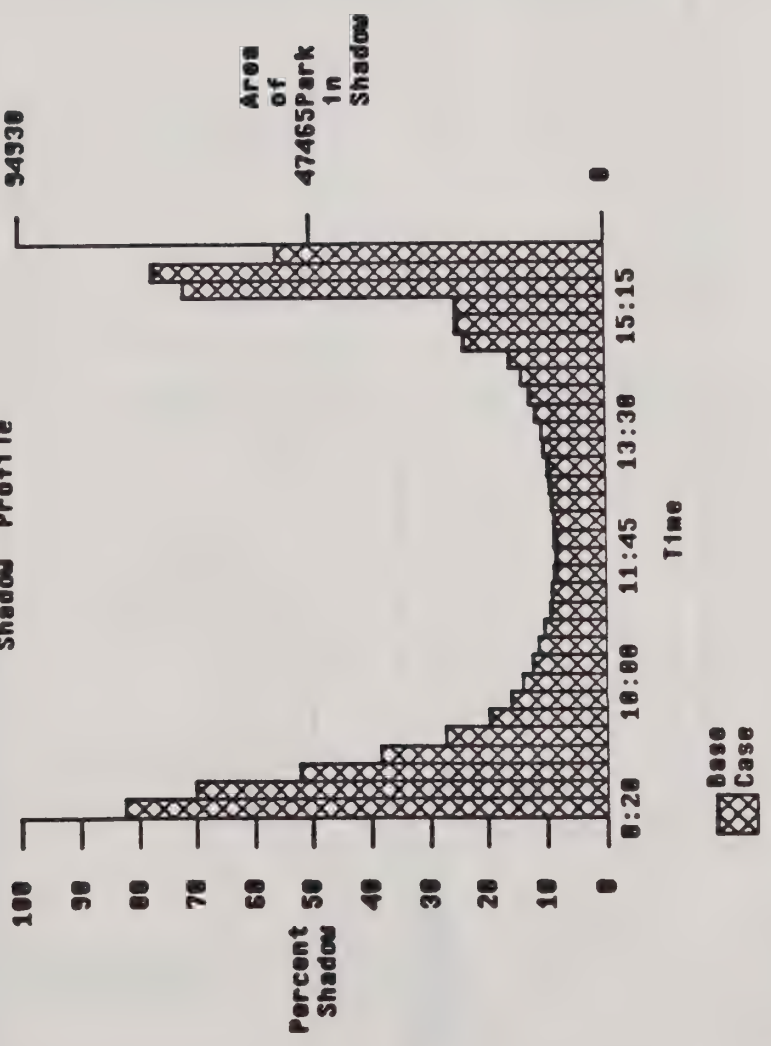
MISTO

Parameters Histogram Exit

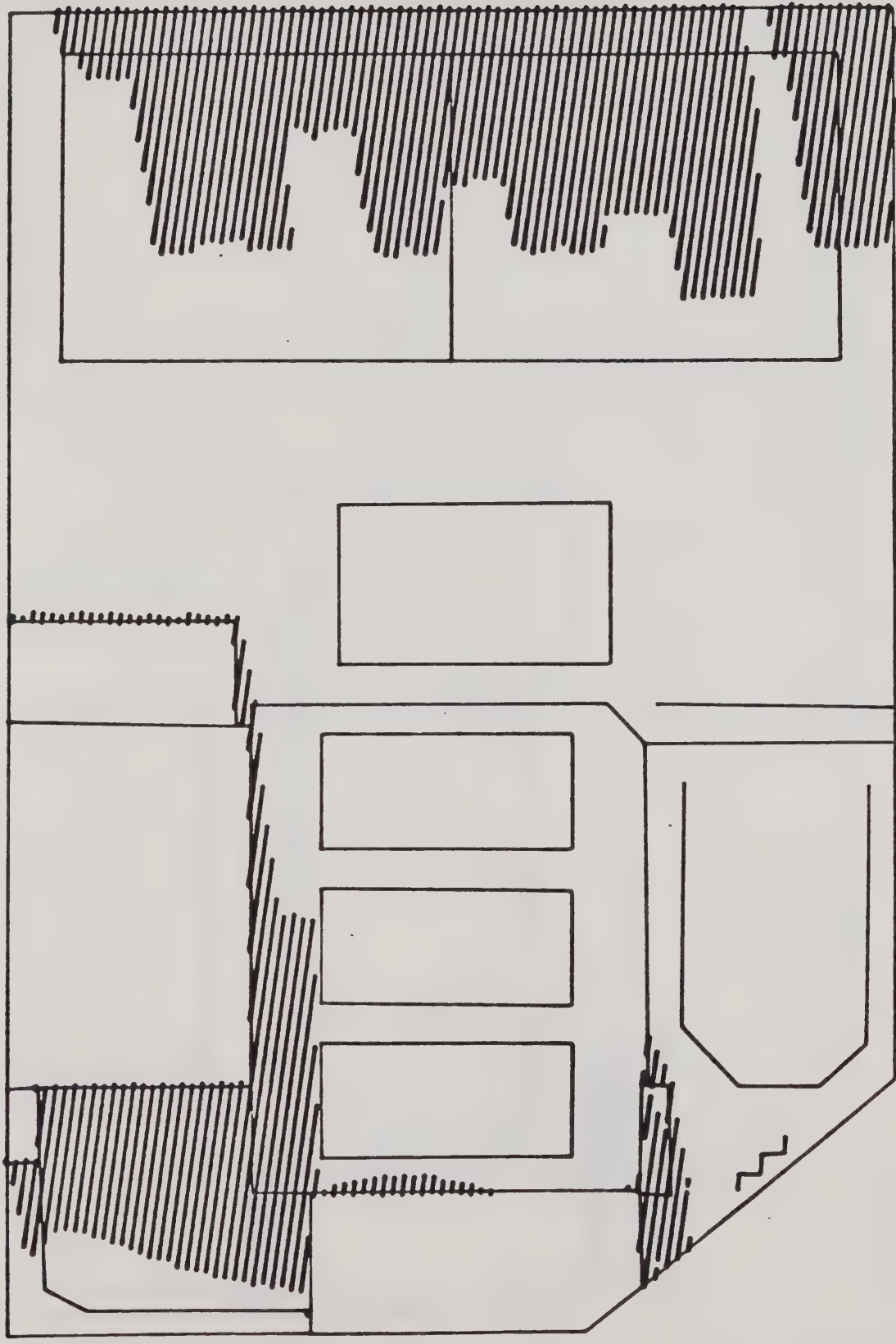
North Beach Playground

December 28, 1987

Shadow Profile



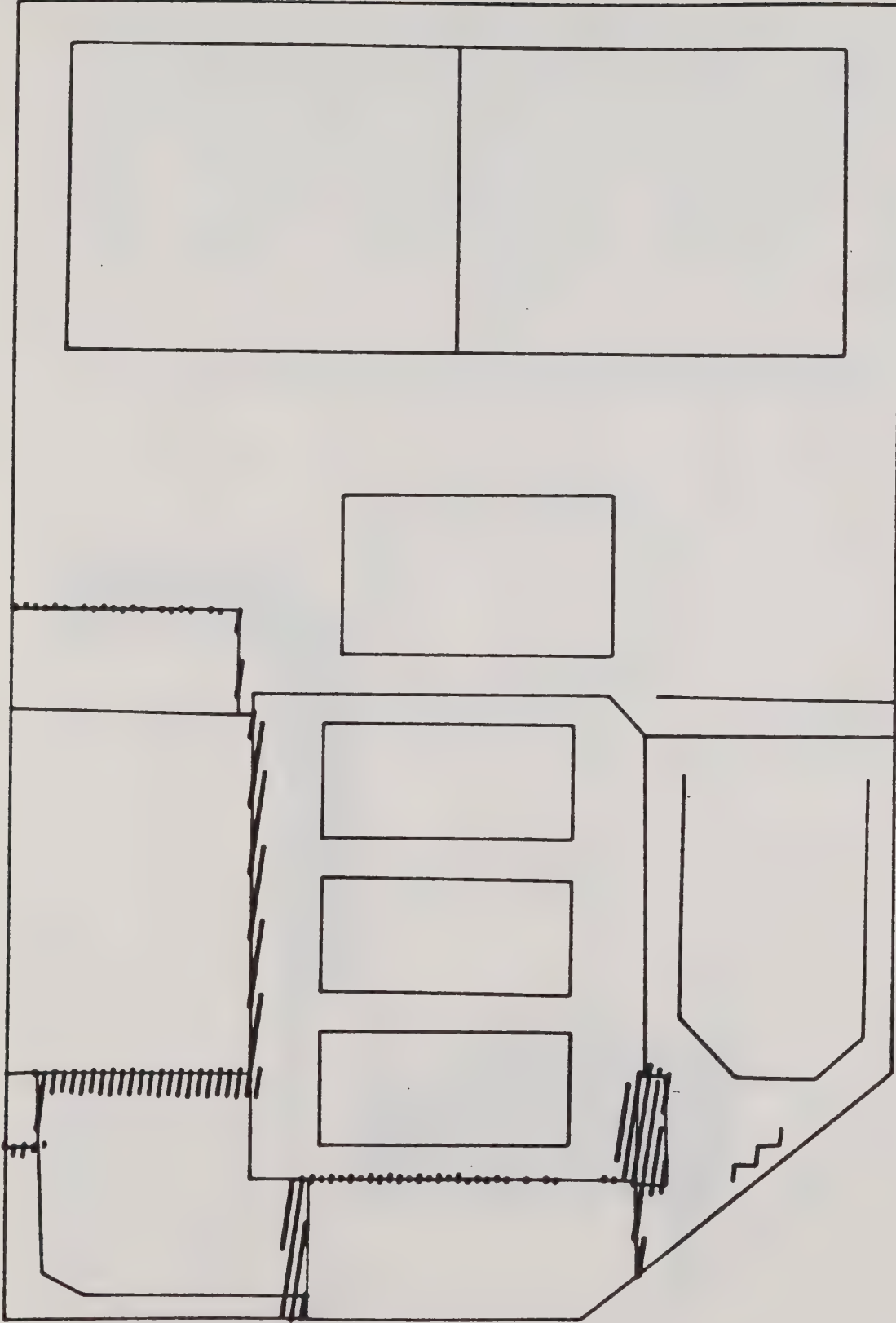
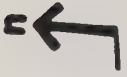




EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 07:30
Scale: 1" = 50'
NORTH BEACH PLAYGROUND

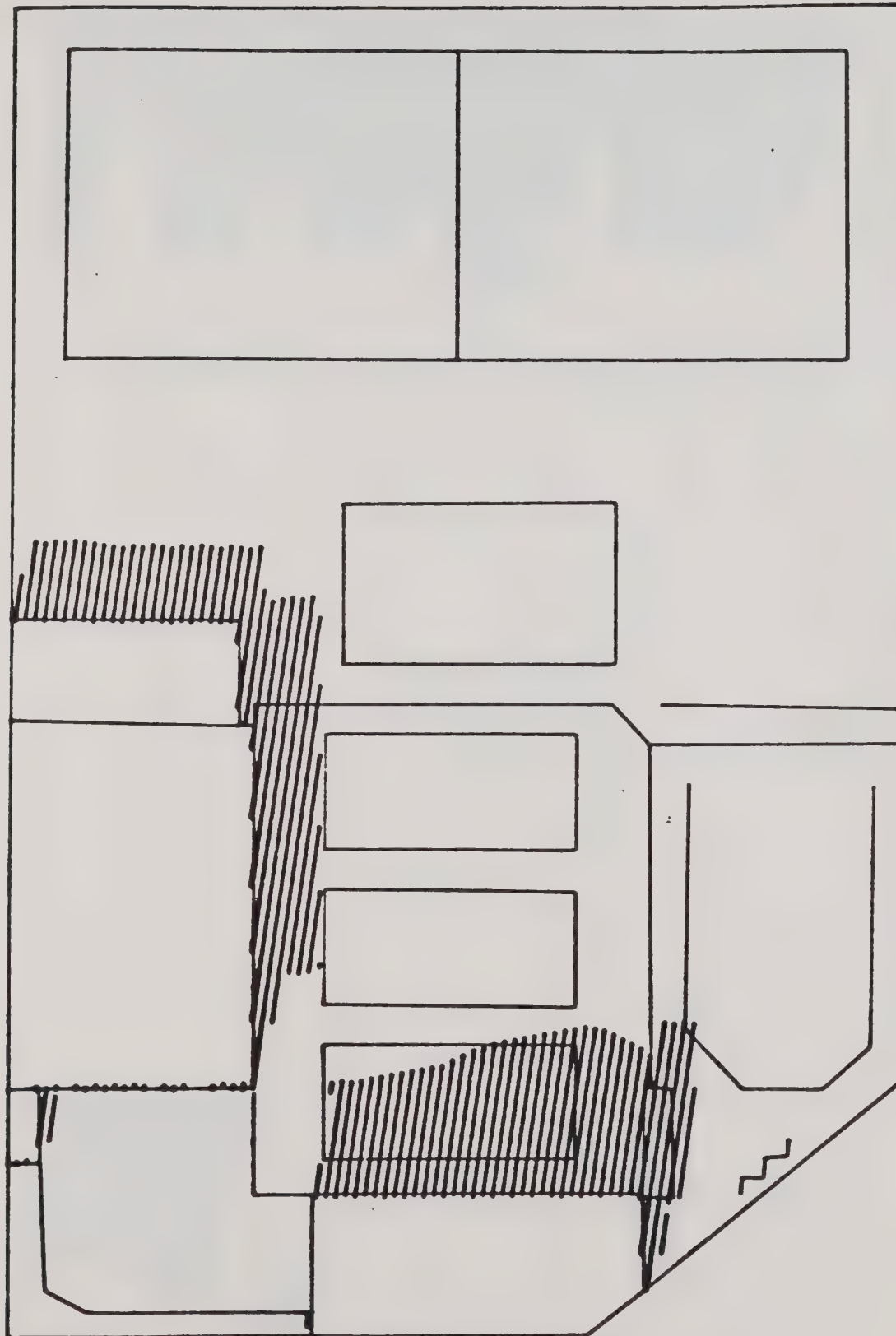




6/21 12:00
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NORTH BEACH PLAYGROUND

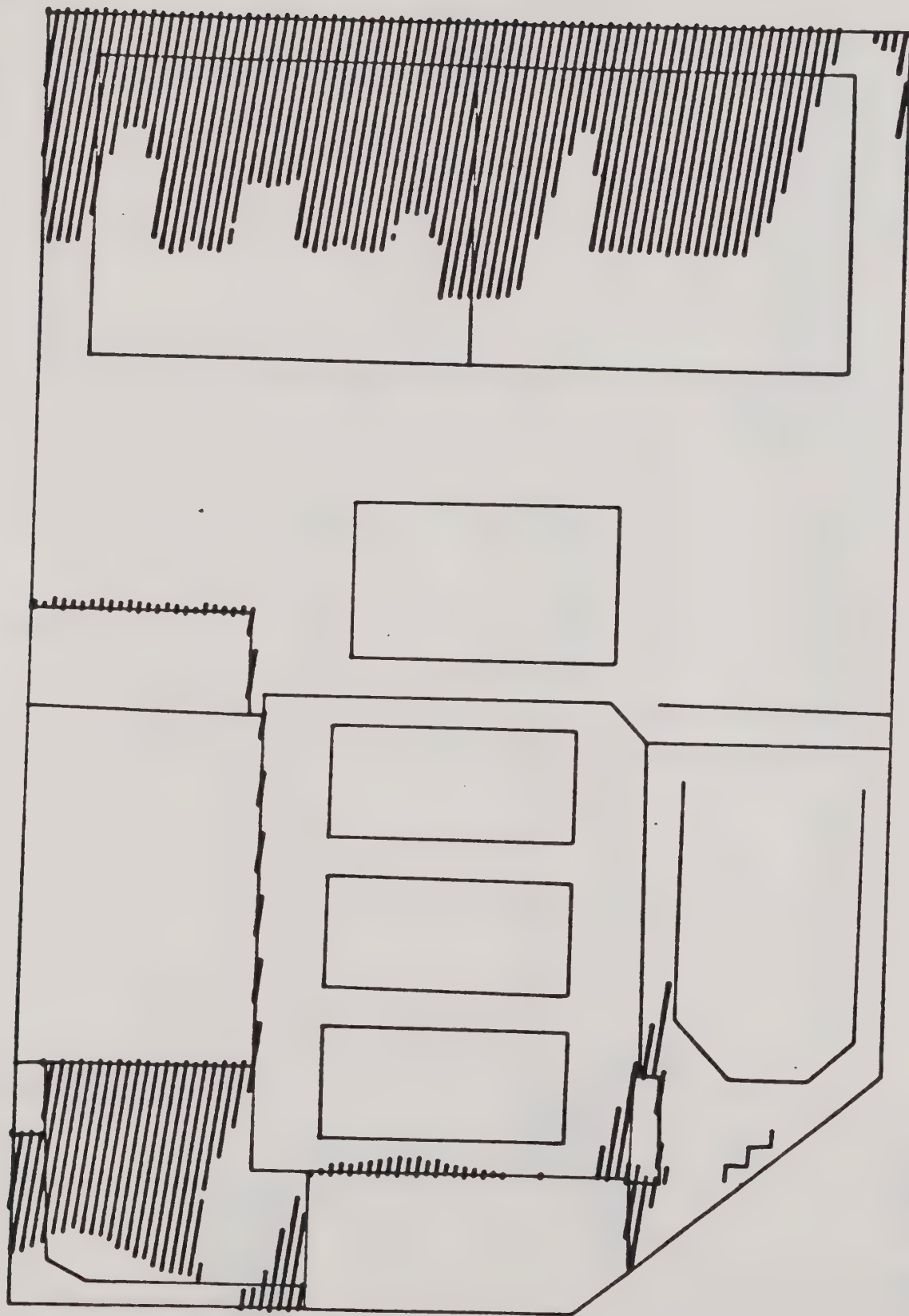
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

6/21 18:00
Scale: 1" = 50'

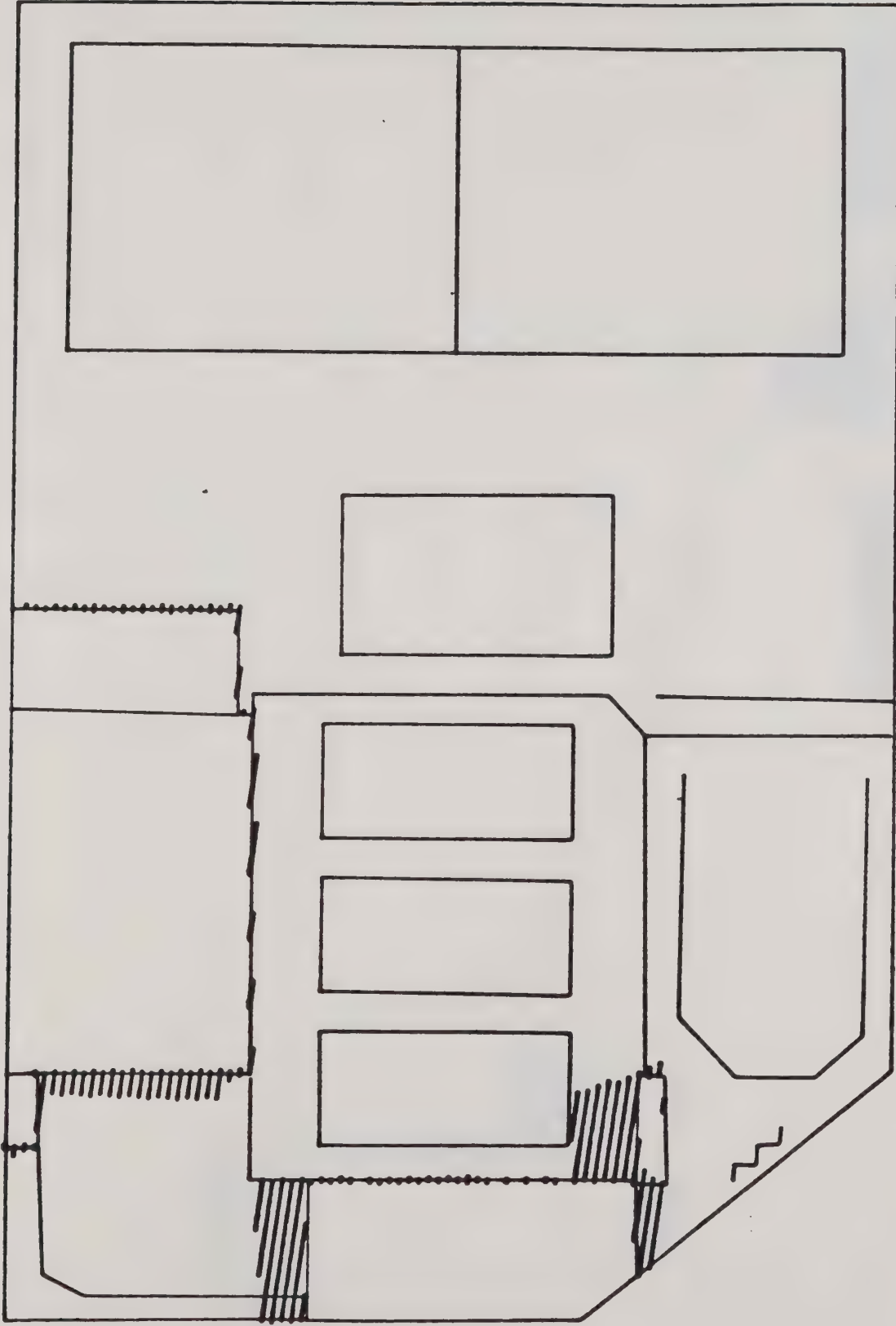
NORTH BEACH PLAYGROUND



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

9/20 08:30
Scale: 1" = 50'

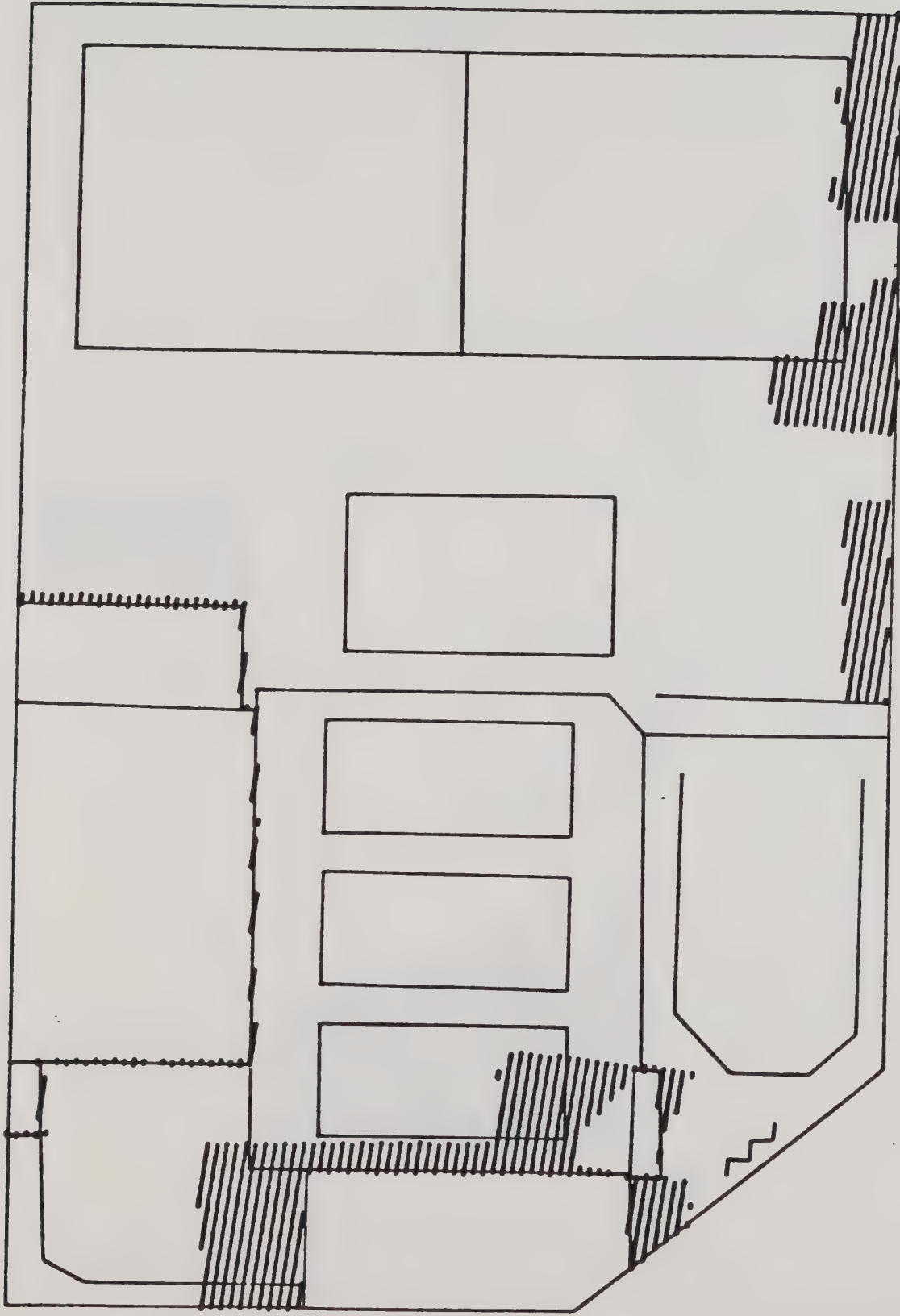
NORTH BEACH PLAYGROUND



9/20 12:00
Scale: 1" = 50'

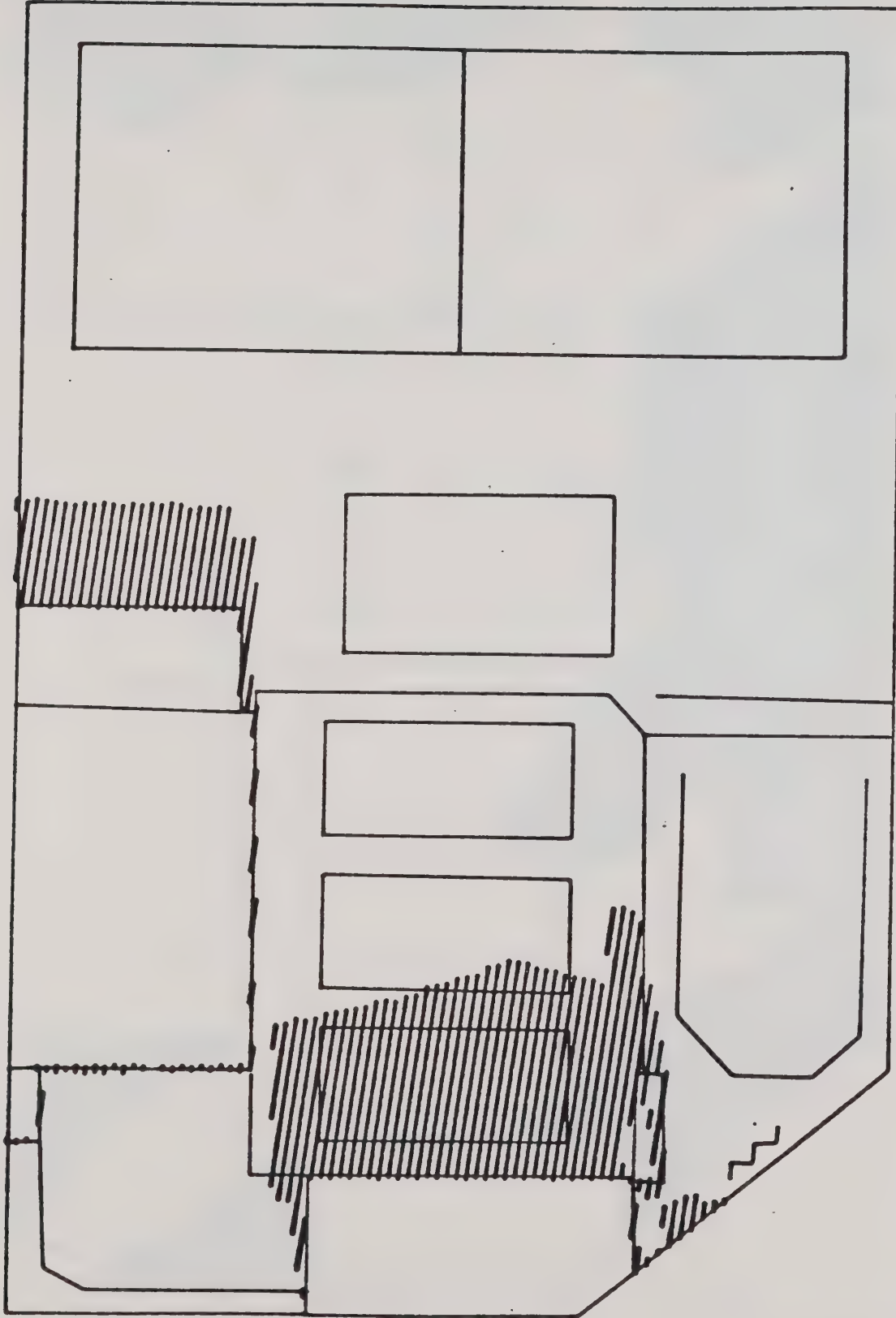
NORTH BEACH PLAYGROUND

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

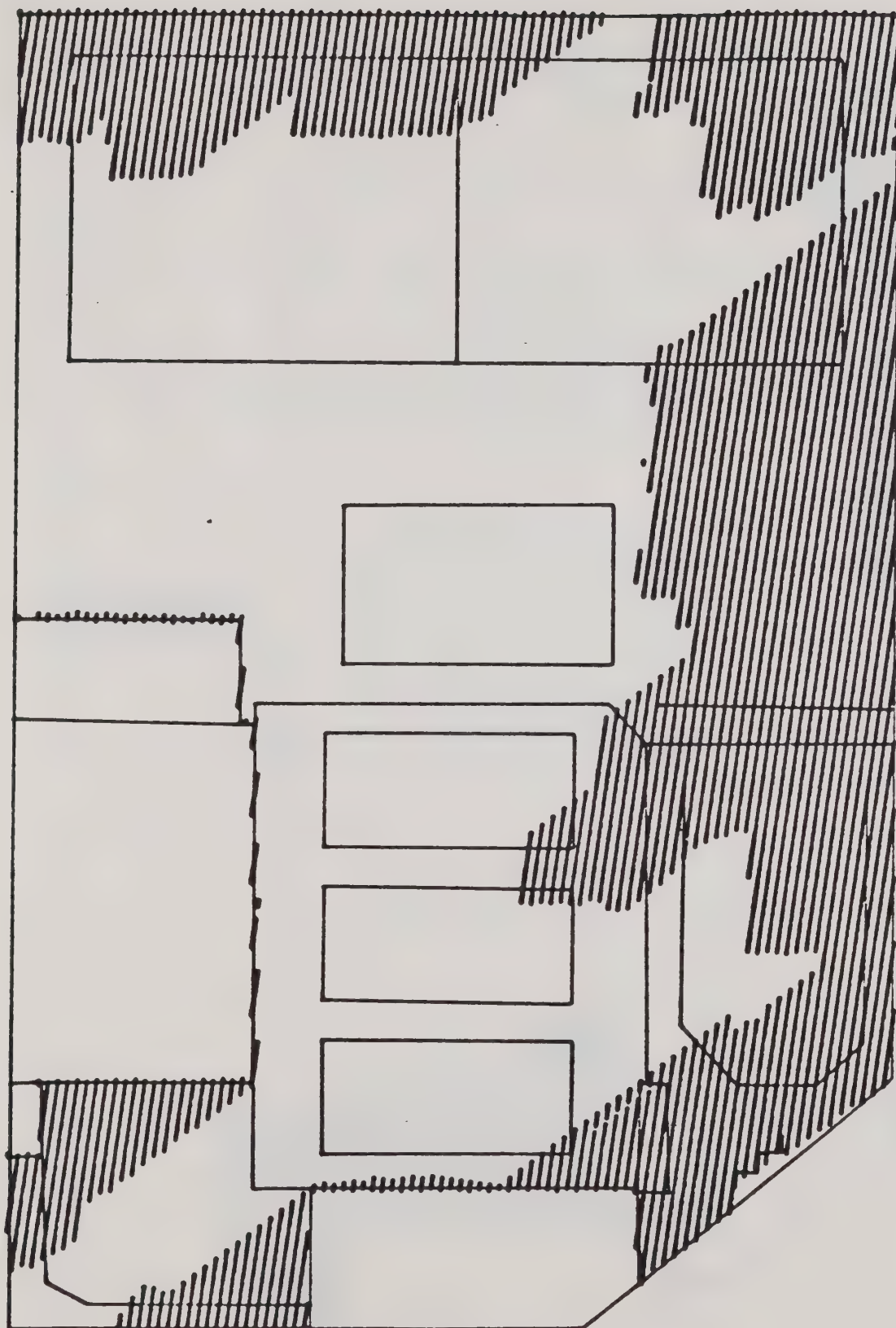
12/20 12:00
Scale: 1" = 50'
NORTH BEACH PLAYGROUND



9/20 17:15
Scale: 1" = 50'

NORTH BEACH PLAYGROUND

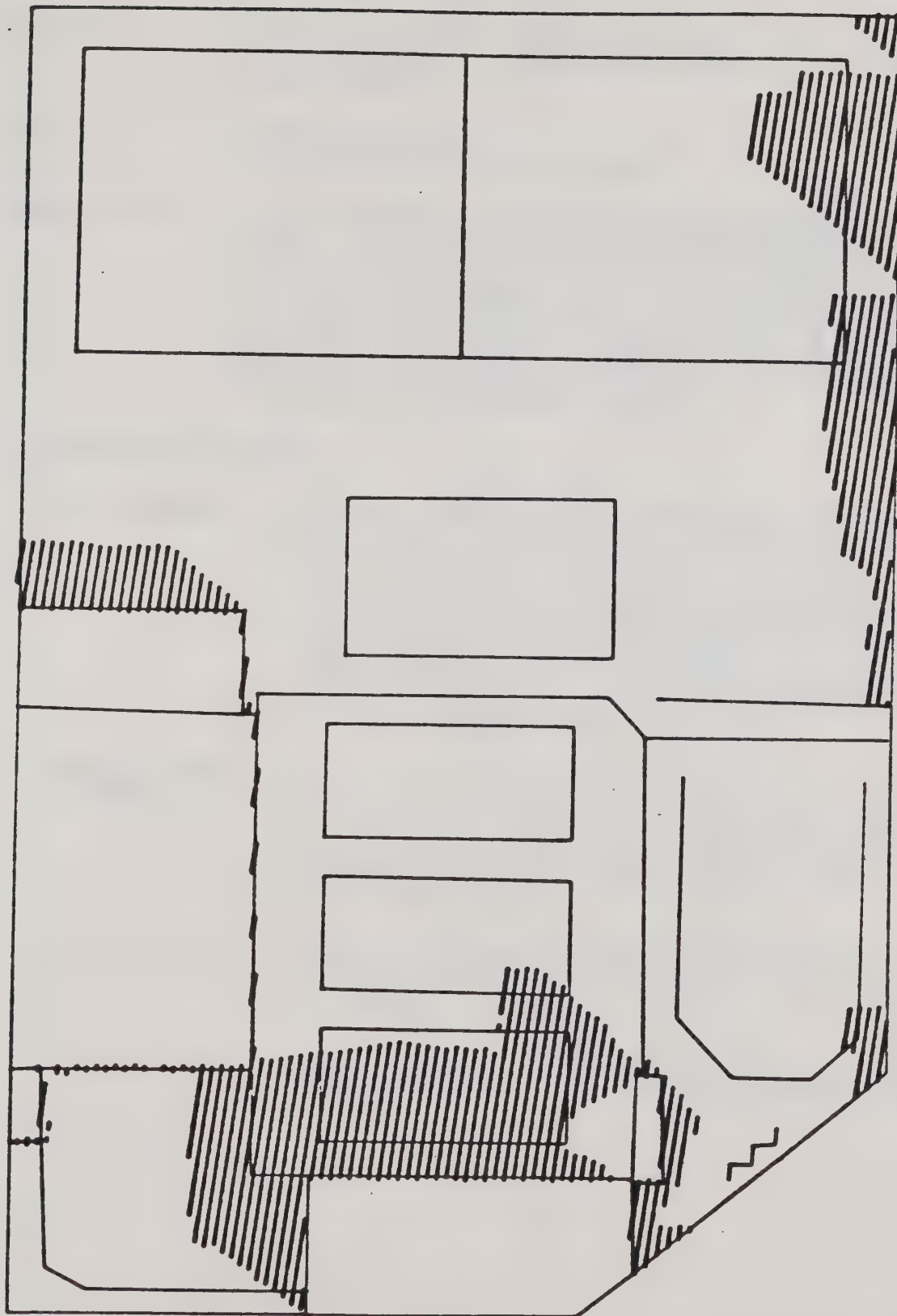
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



12/20 09:00
Scale: 1" = 50'

NORTH BEACH PLAYGROUND

- EXISTING SHADOW
- MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



12/20 14:15
Scale: 1" = 50'

NORTH BEACH PLAYGROUND

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: Maritime Plaza

LOCATION: Battery, Washington, Davis and Clay
This open space is located to the North of the Embarcadero Center complex.

SIZE: 83,936 square feet
The sixth largest Downtown park.

CHARACTERISTICS: A tall building separates the East and West ends of the plaza. Parking facilities are located beneath the plaza and it is elevated from street level. Access to the plaza is by centrally located stairs and stairs on the West end. The plaza contains some lawn area, vegetation, sculptures and a fountain. Very few seating facilities are located in the plaza. Utilization of the park is not intense and most of the users are downtown workers.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: This open space is heavily impacted by shadows - 68.4% of the annual sun resource is currently in shadow. During May, June and July the general shape of the shadow profile distribution is a relatively steep "V" shape with significant morning and afternoon shadows. During the remainder of the Summer and Fall the "V" shape becomes increasingly filled in with mid-day shadows. By December, no less than 80% of the park is in shadow during any hour of the day.

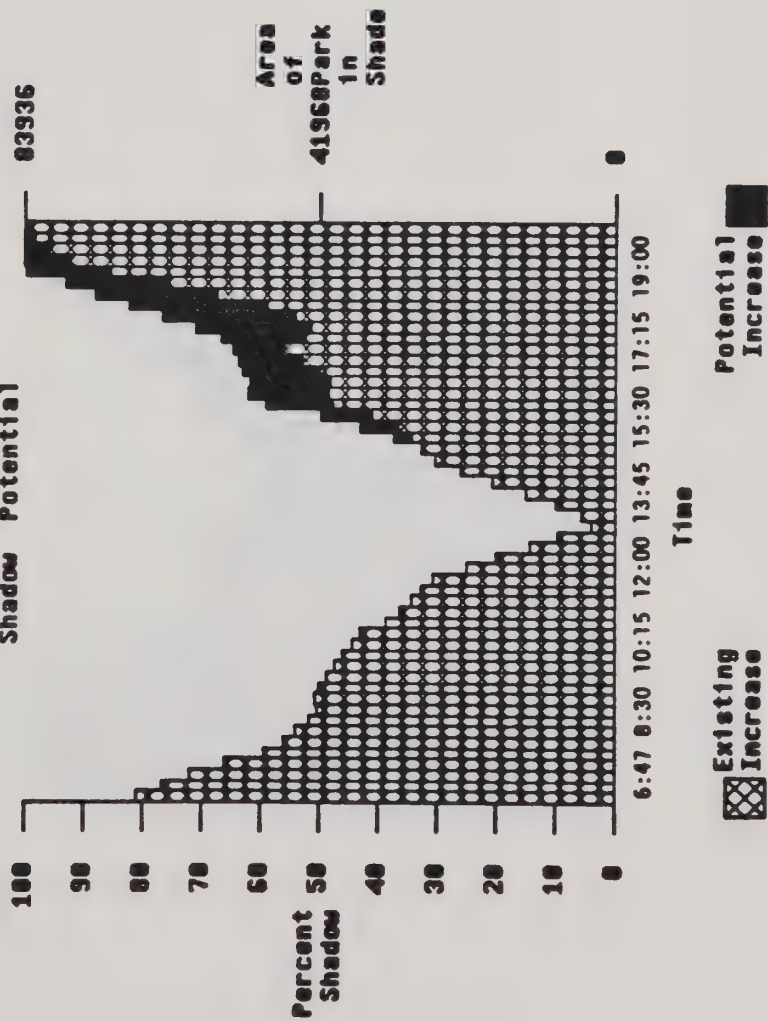
Seasonal Shadow:

- Summer: Except for 2-3 hours during mid-day more than 50% of the plaza is in shadow. Afternoon shadow impacts are greater than early morning shadows. As the Fall approaches the morning shadow increase. 50% shaded during Summer Solstice.
- Spring/Fall: During the Fall and late Spring the open space is more than 50% shaded throughout the day. 75% shaded during the Equinox.
- Winter: During the Winter 65% or more of the park is shaded throughout the day. 90% shaded during Winter Solstice.

Maritime Plaza

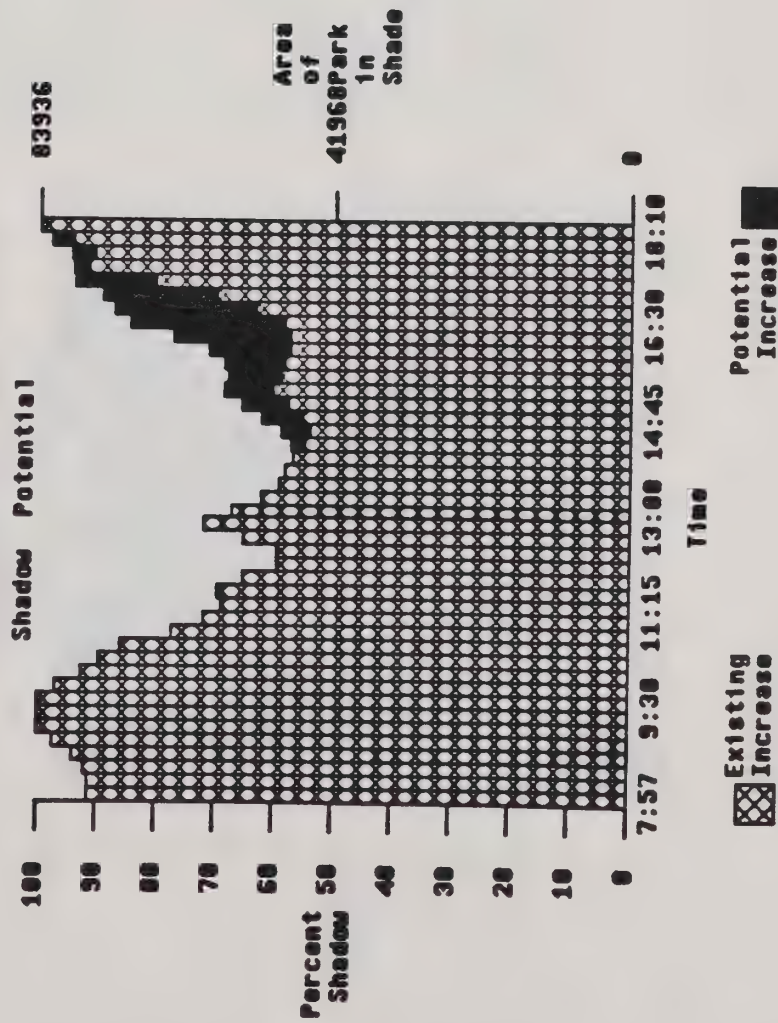
June 21, 1987

Shadow Potential



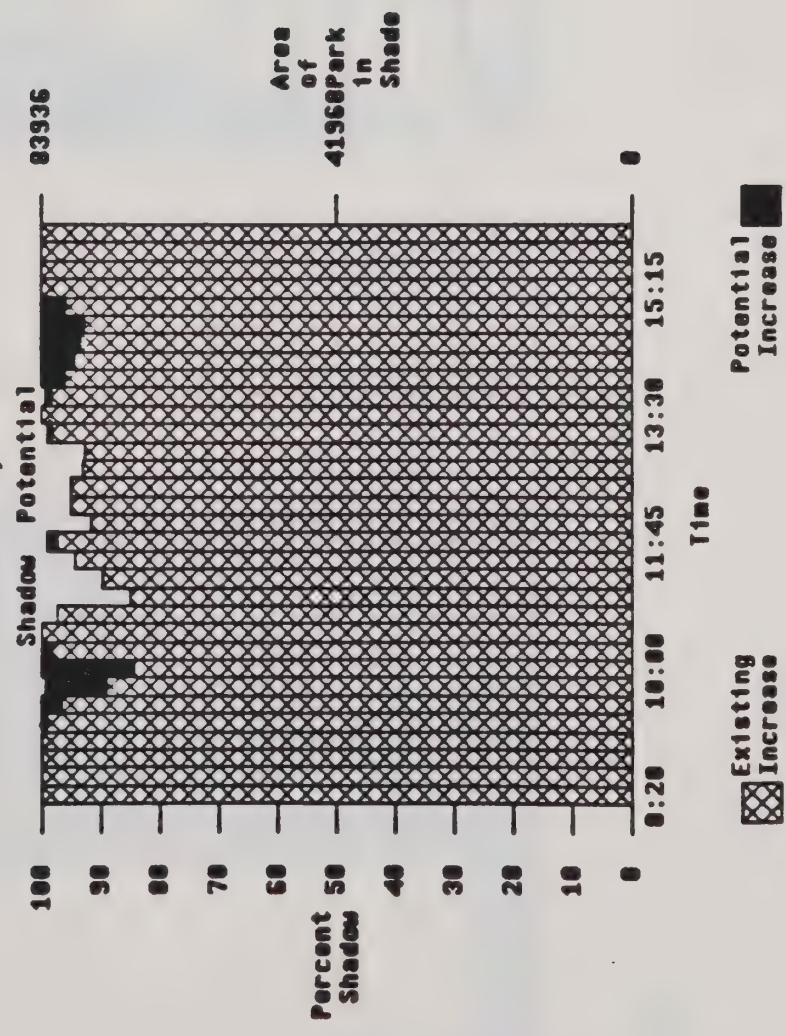
Maritime Plaza

September 20, 1987 (March)

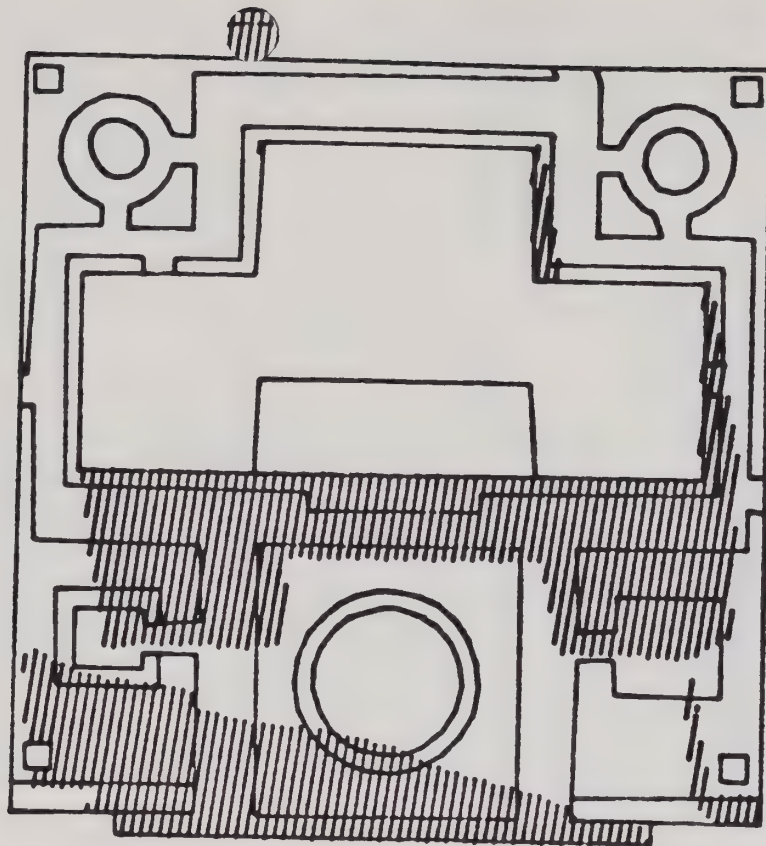


Maritime Plaza

December 20, 1987



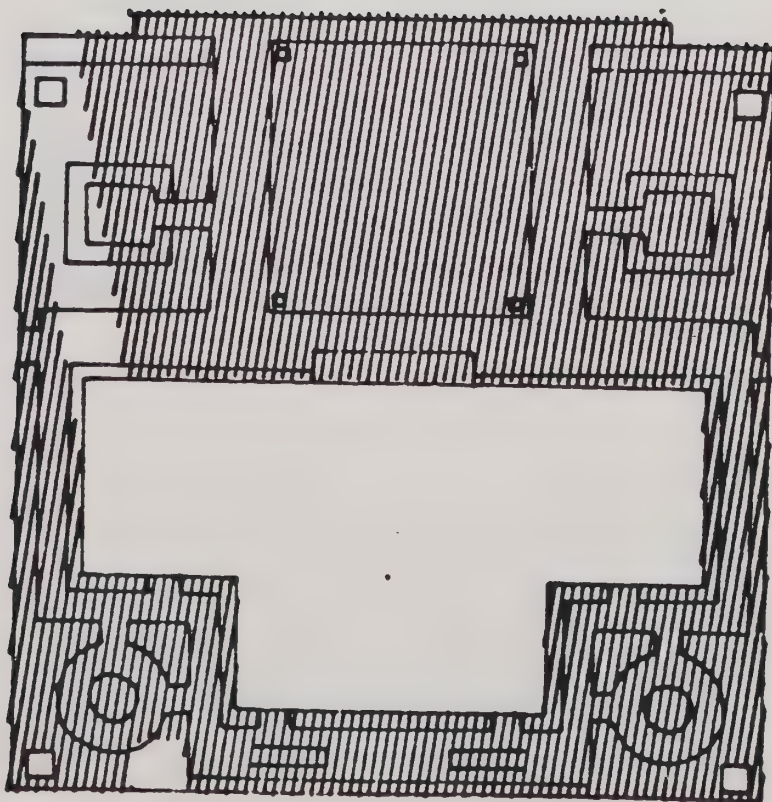




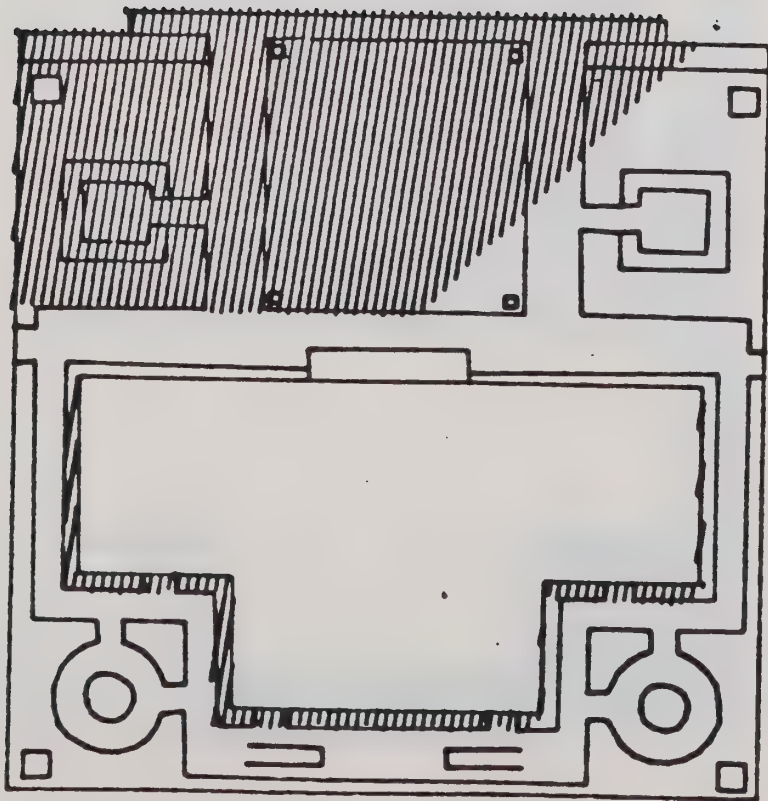
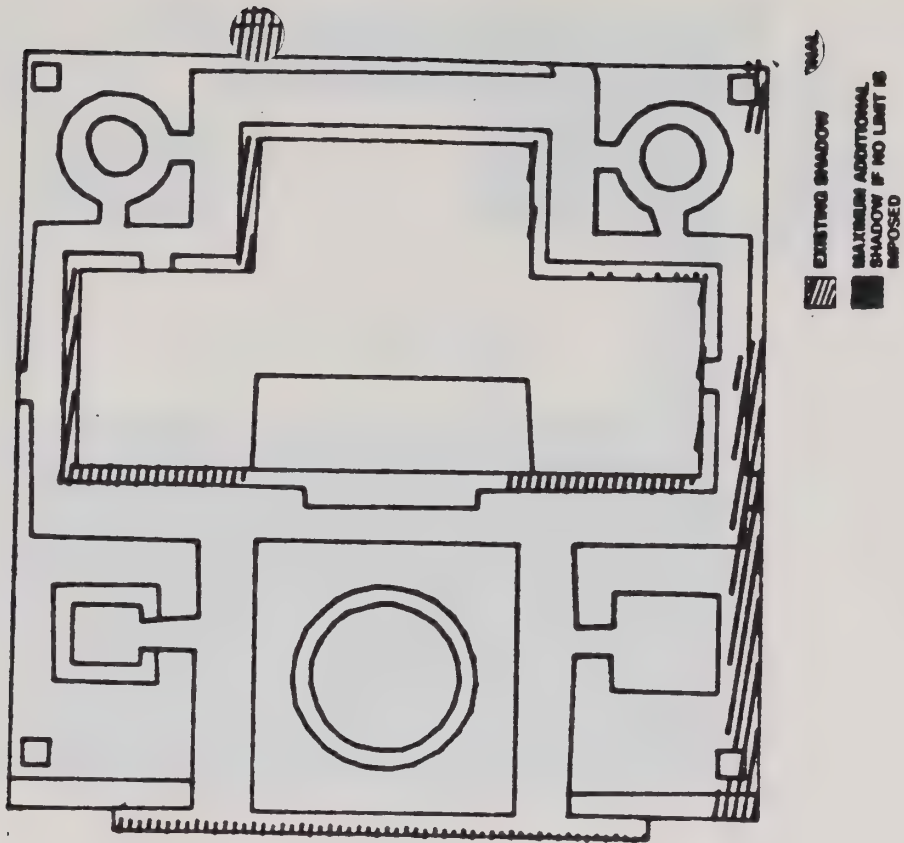
DMAL

EXISTING SHADOW

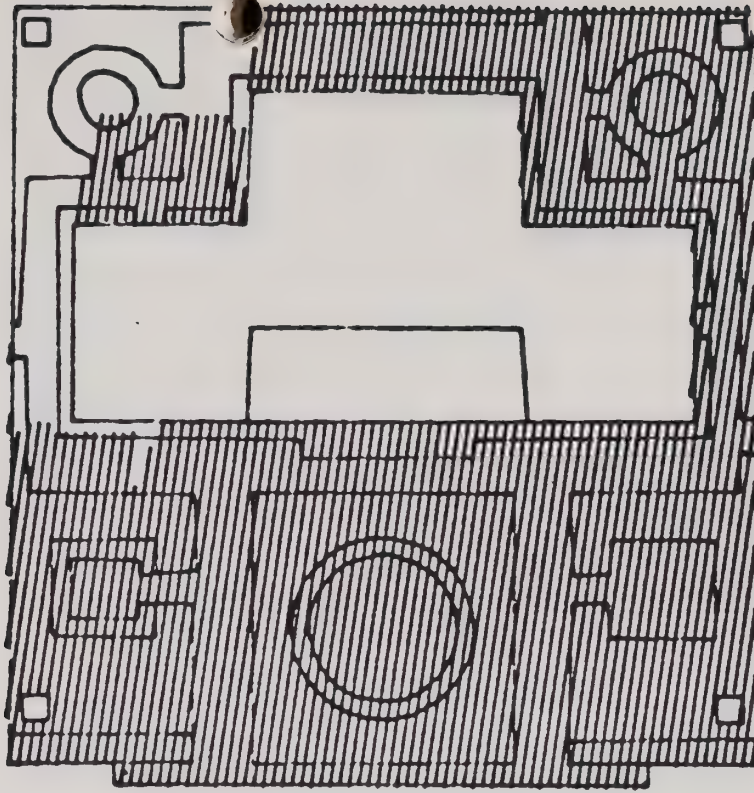
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



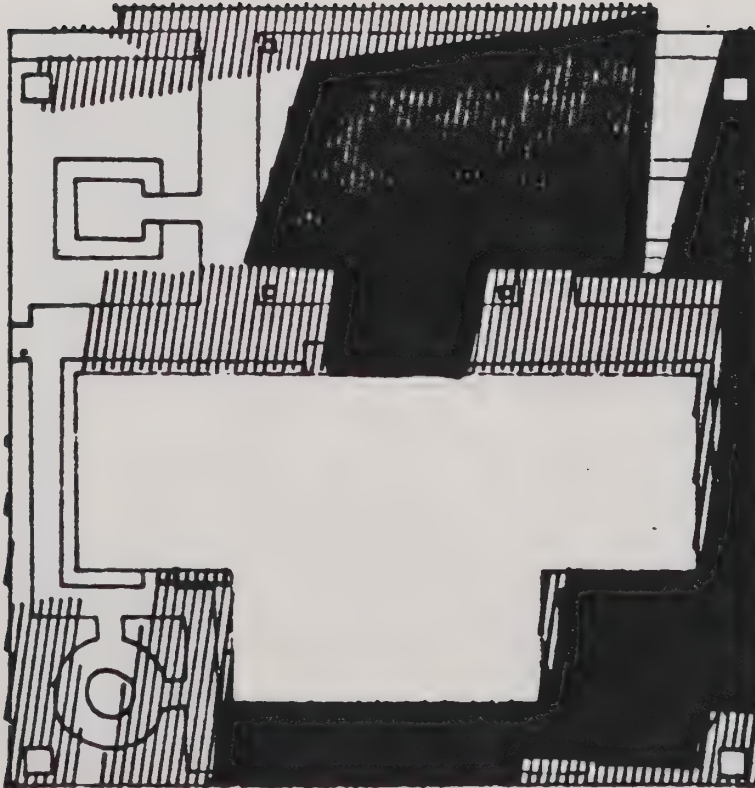
6/21 07:30
Scale: 1" = 70'
MARITIME PLAZA



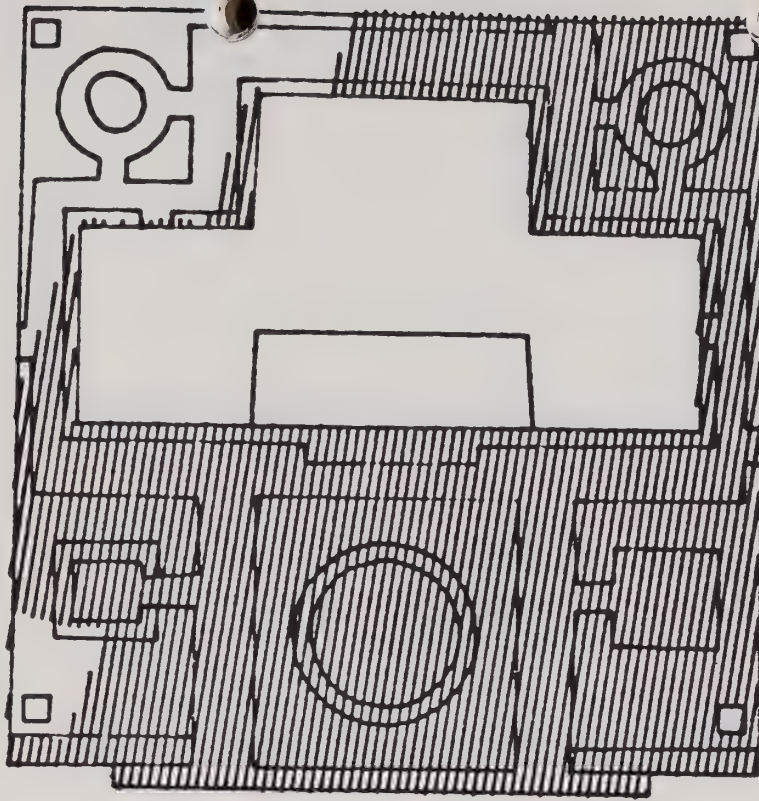
6/21 12:00
Scale: 1" = 70'
MARITIME PLAZA



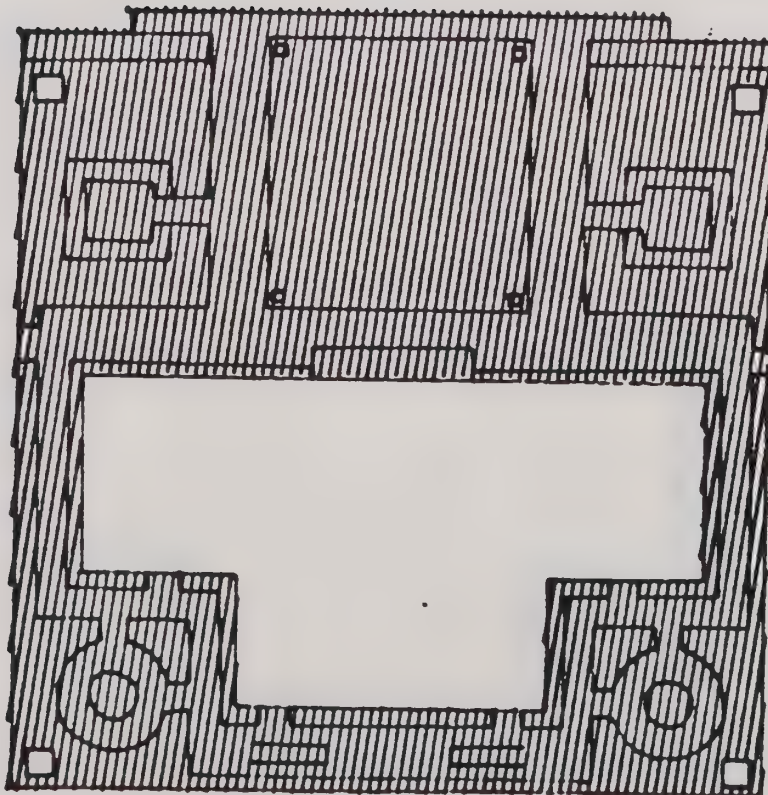
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



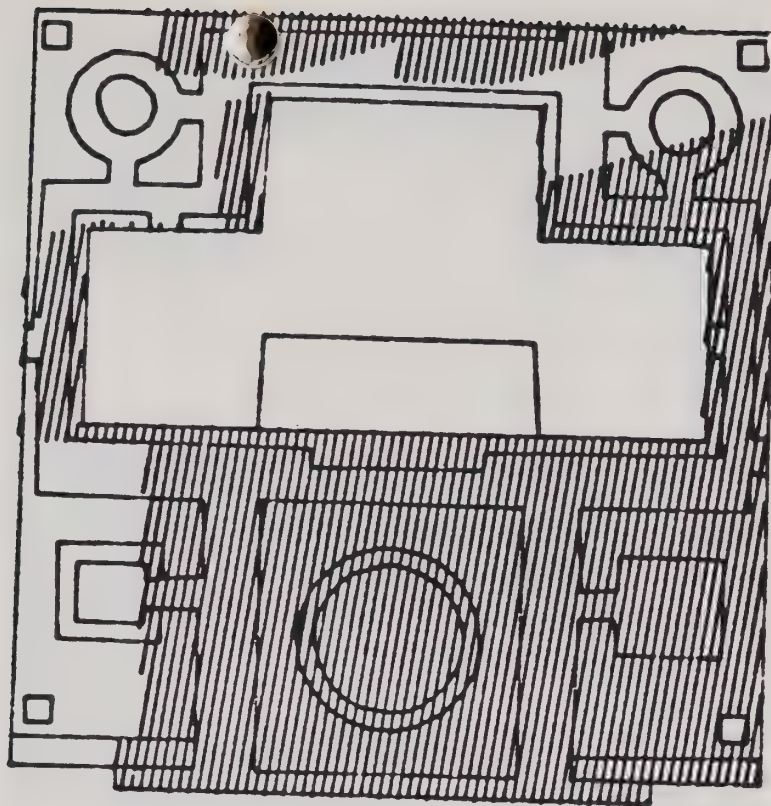
6/21 18:00
Scale: 1" = 70'
MARITIME PLAZA



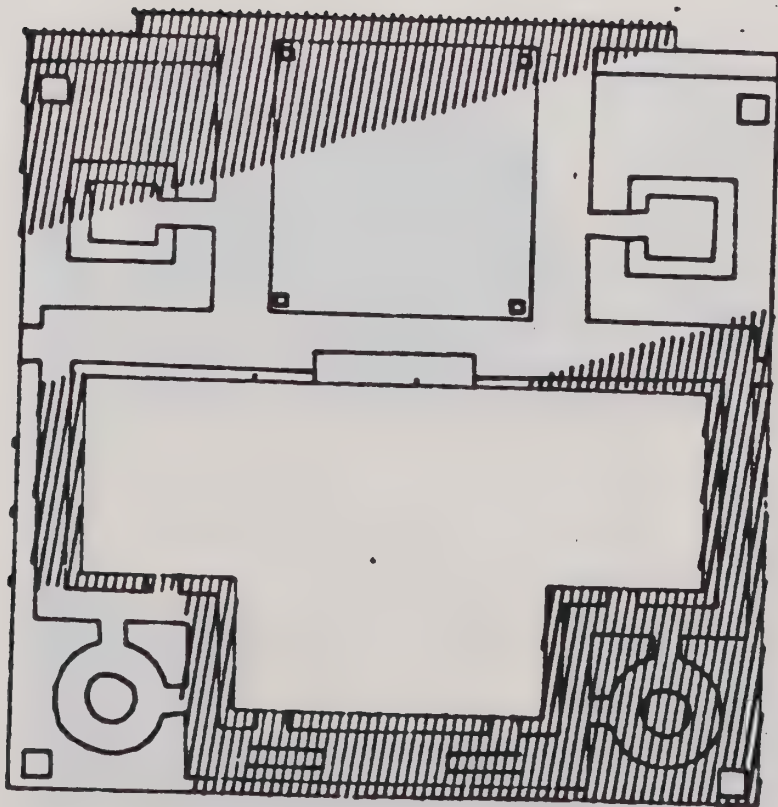
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



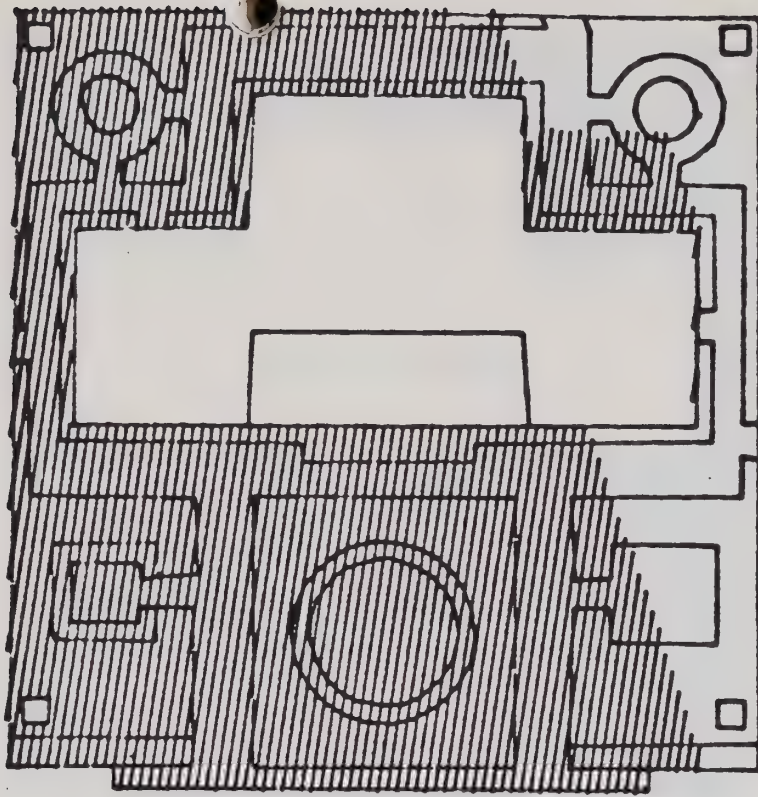
9/20 08:15
Scale: 1" = 70'
MARITIME PLAZA



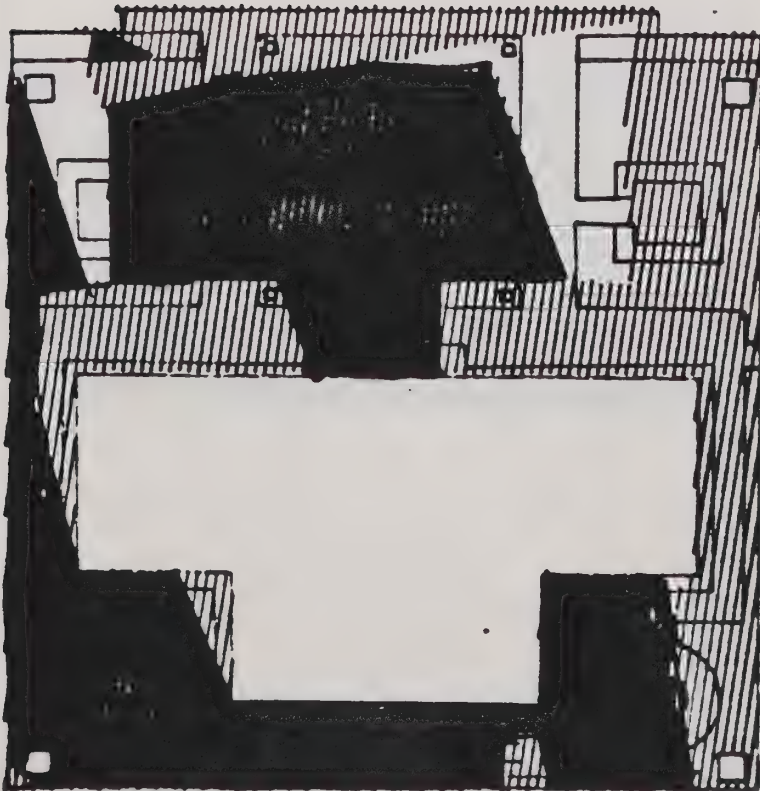
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



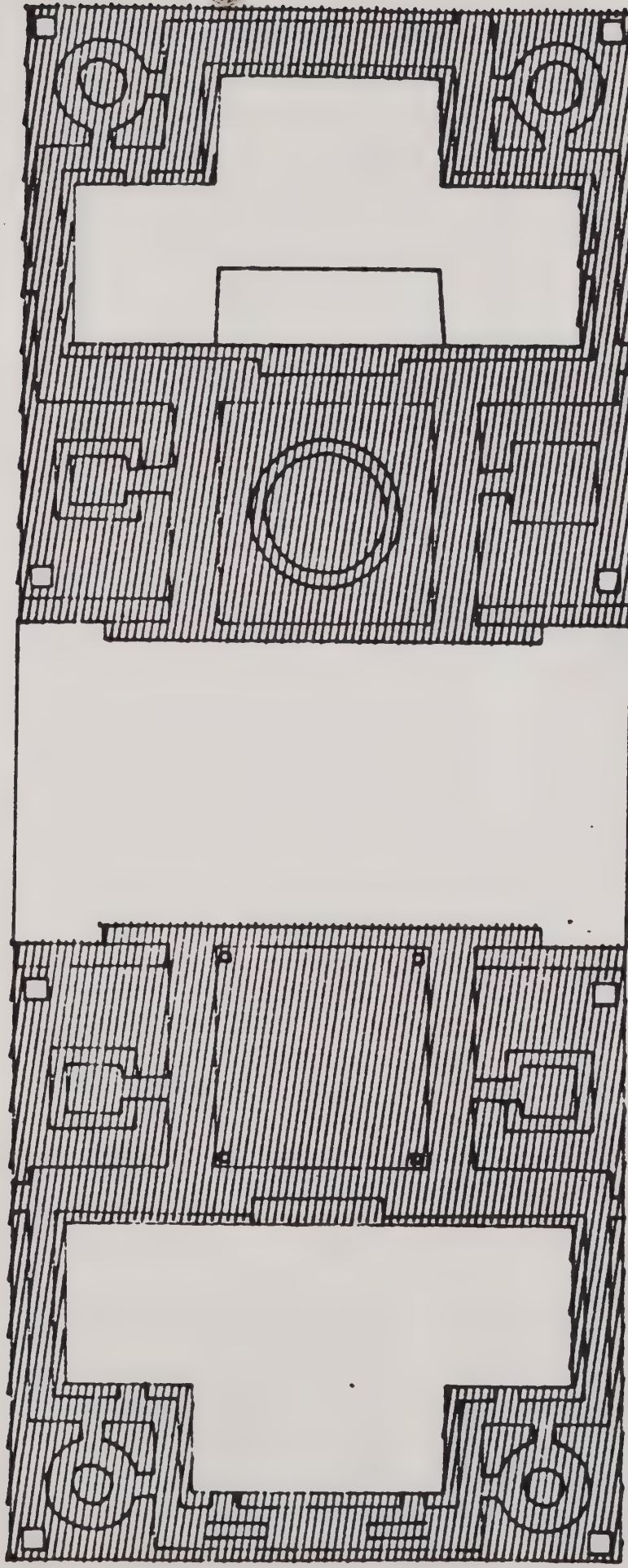
9/20 12:00
Scale: 1" = 70'
MARITIME PLAZA



EXISTING SHADOW
HATCHED
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED
SOLID

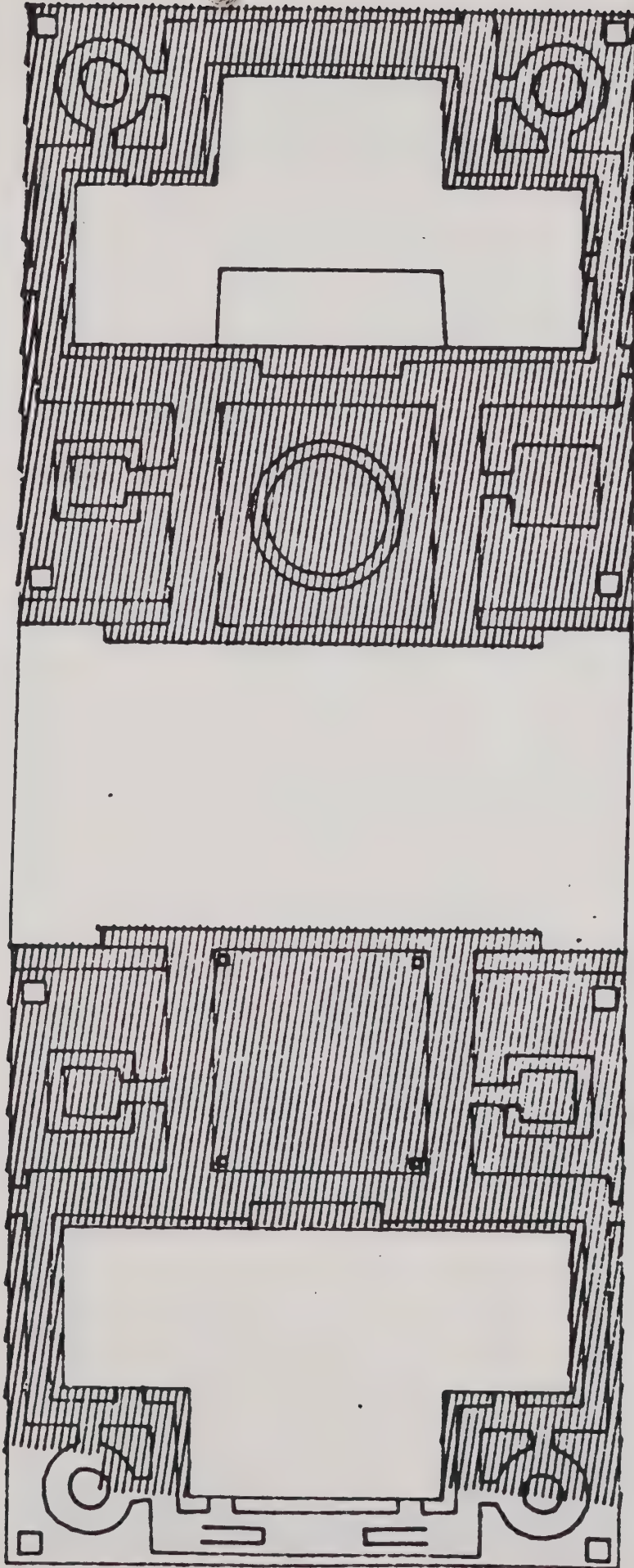


9/20 16:30
Scale: 1" = 70'
MARITIME PLAZA



12/20 09:00
Scale: 1" = 70'
MARITIME PLAZA

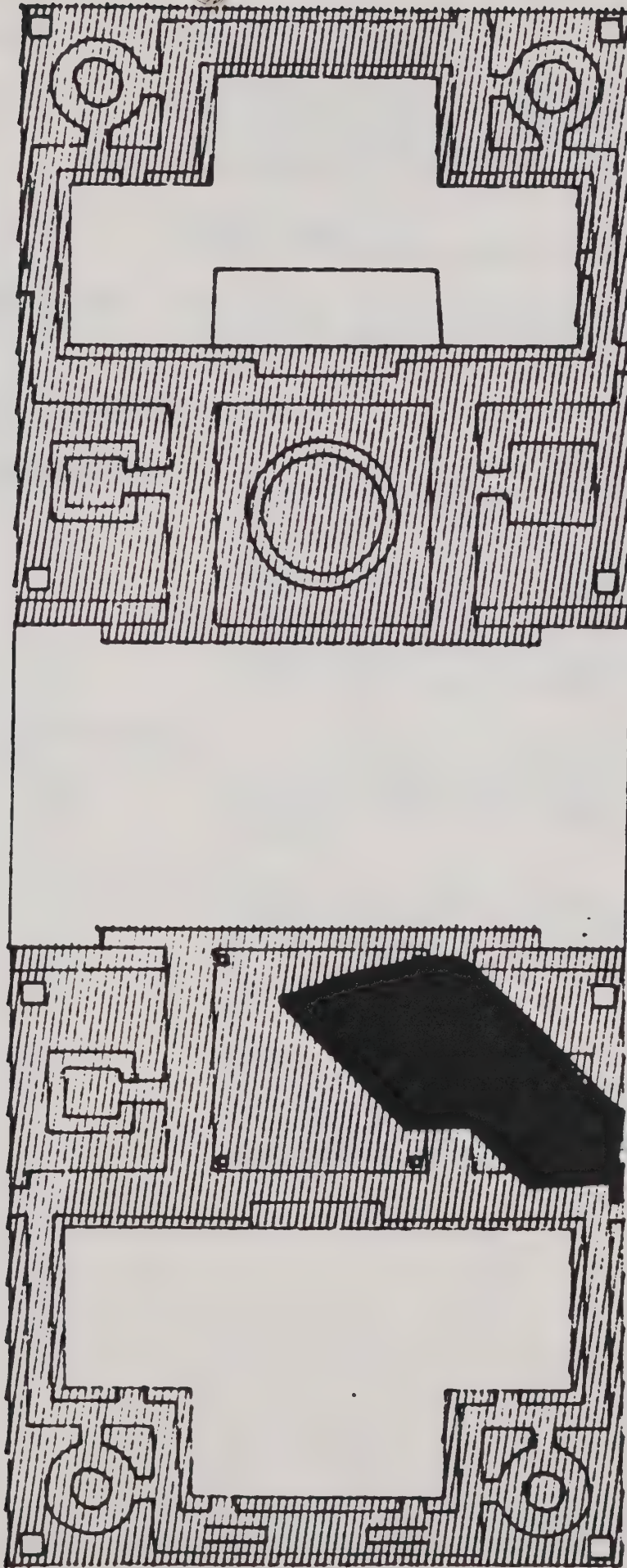
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

12/20 12:00
Scale: 1" = 70'
MARITIME PLAZA





12/20 14:45
Scale: 1" = 70'
MARITIME PLAZA

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: Embarcadero Center 1

LOCATION: Washington, Drumm, Clay & Embarcadero
This park is located to the North of the 480 Highway ramps for Clay and Washington Streets and is surrounded by high rise commercial buildings.

SIZE: 58,395 square feet
This is the seventh largest Downtown park.

CHARACTERISTICS: The park is flat and contains lawn areas and walkways. The park is not heavily used because of its relatively isolated location.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: This park is relatively sunny - 35.1% of the annual sun resource is in shadow. Afternoon shadows are greater than morning shadows resulting in a "J" shaped shadow profile curve during June and July. In March, April August and September mid-day shadows increase and the shadow profile curve becomes a "W" shape. Between October and February the mid-afternoon shadows increase dramatically and the shape of the shadow profile curve is a flat "J" shape shifted towards the morning hours.

Seasonal Shadow:

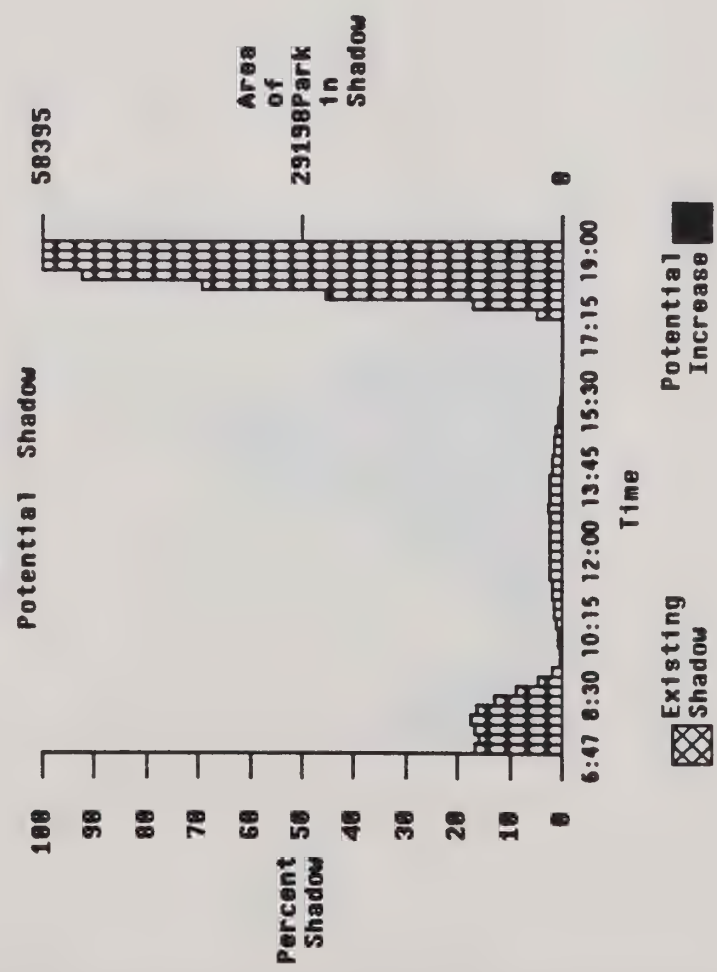
- **Summer:** During this season the park is sunny except in the late afternoon hours. 10% shadowed during the Summer Solstice.
- **Spring/Fall:** Morning and afternoon shadow patterns during Fall and Spring are similar to the Summer shadow pattern. Mid-day shadows increase to nearly 70% of the park due to buildings located to the South of the park. 35% shaded during the Equinox.
- **Winter:** Shadow patterns in Winter display heavy shadows throughout the day with the greatest sun resource occurring during early morning hours. No less than 35% of the park is in shade during mid-December days. 75% shaded during Winter Solstice.

HISTO

Parameters Histogram Exit

Embarcadero Center 1

June 21 1987



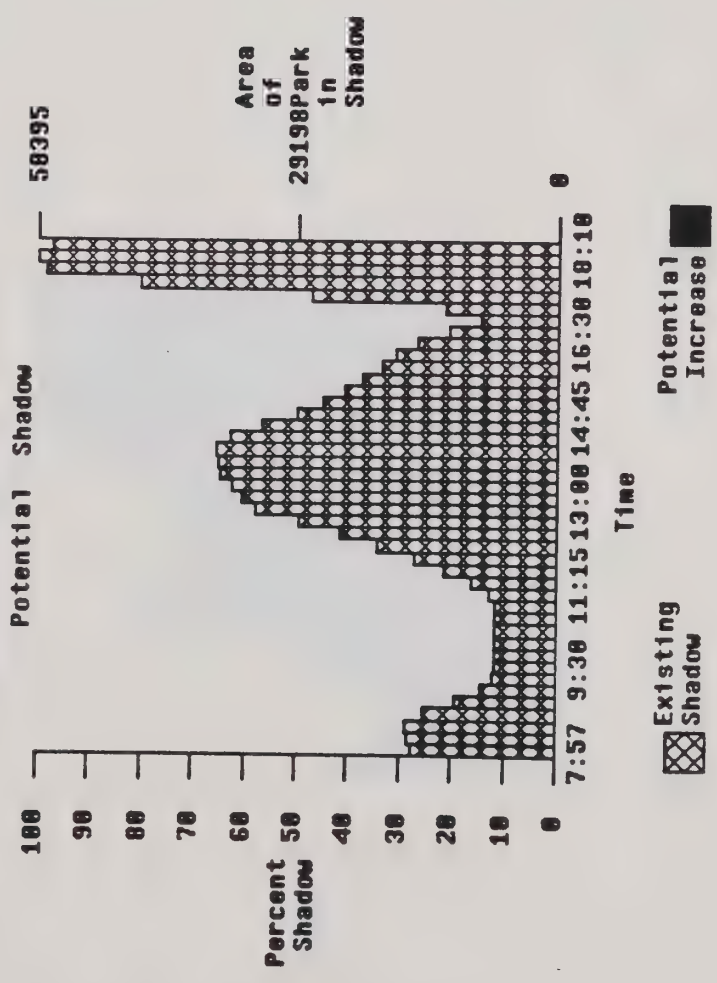


HISTO

Parameters Histogram Exit

Embarcadero Center 1

September 20, 1987 (March)

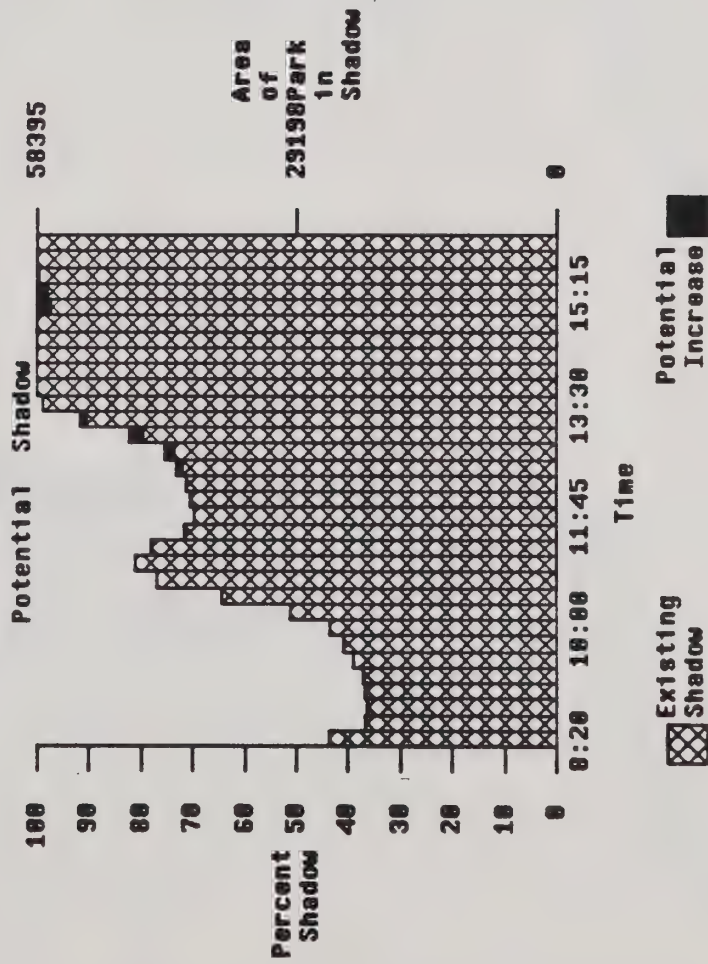


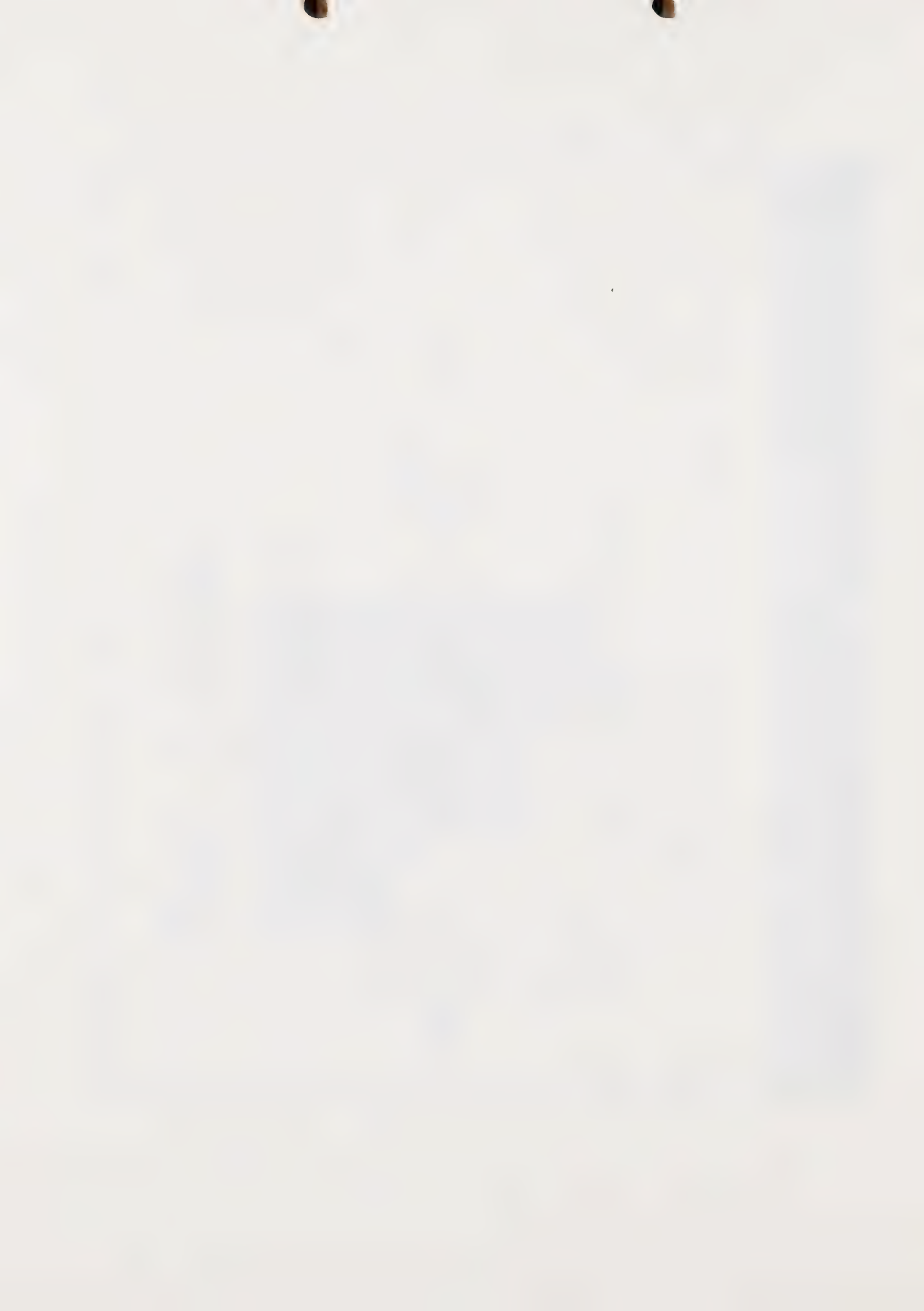
HISTO

Parameters Histogram Exit

Embarcadero Center 1

December 20, 1987







6/21 07:30





6/21 12:00



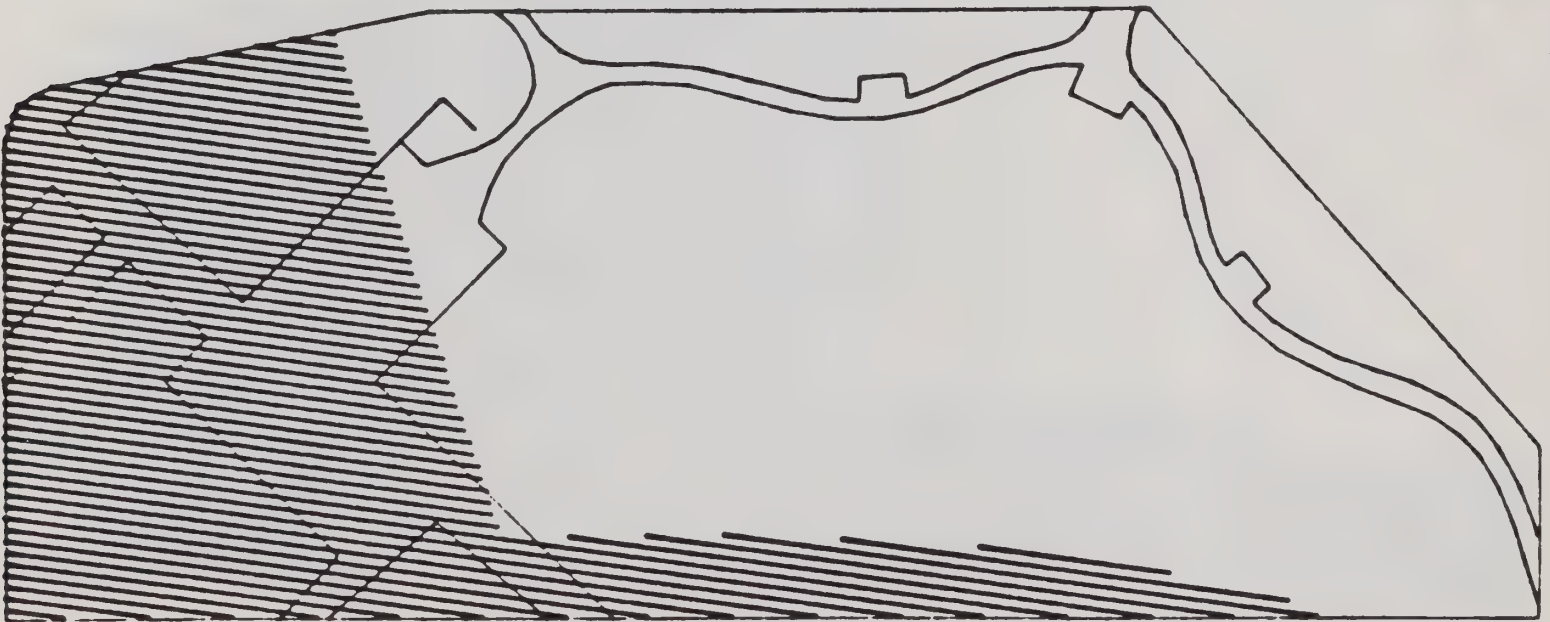
EMBARCADERO CENTER 1

6/21 18:00
Scale: 1" = 50'

-  EXISTING SHADOW
-  MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



9/20 09:15



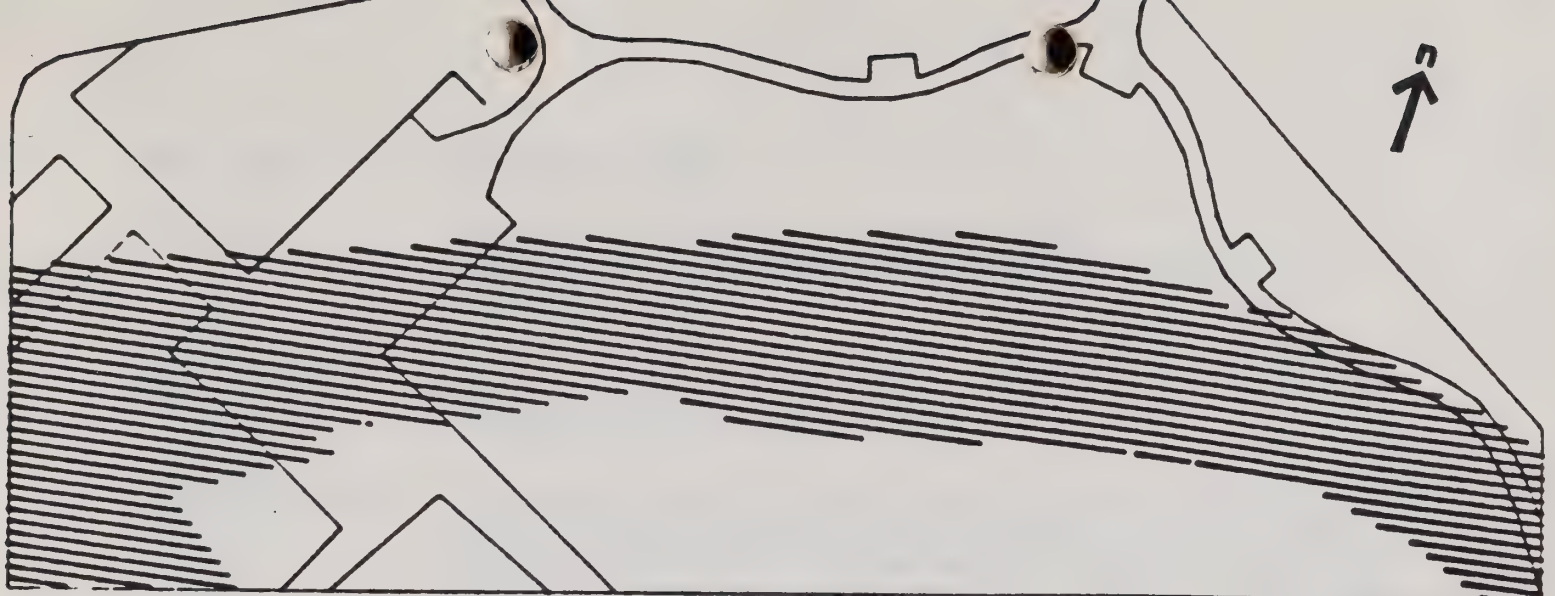
9/20 12:00



EMBARCADERO CENTER 1

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

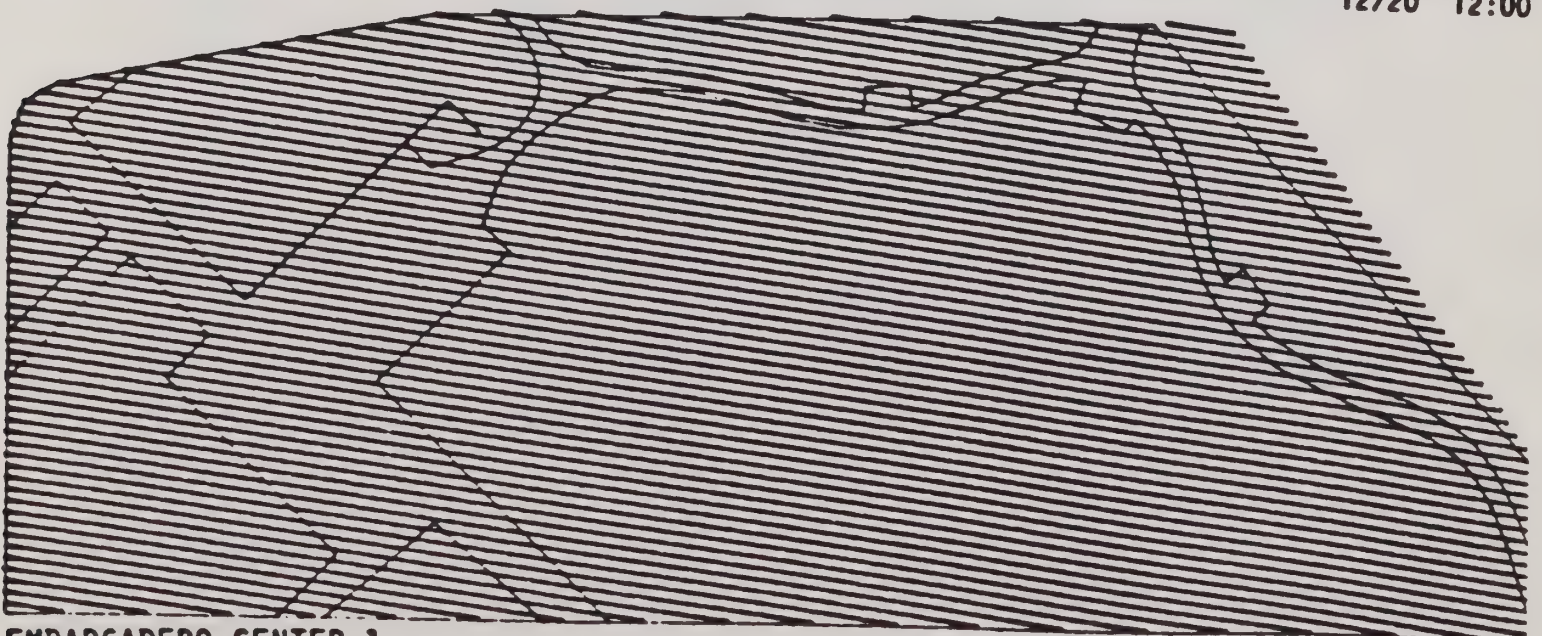
9/20 18:00
Scale: 1" = 50'



12/20 09:15



12/20 12:00



EMBARCADERO CENTER 1

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

12/20 15:00
Scale: 1" = 50'

PARK NAME: Portsmouth Square

LOCATION: Washington, Kearny, Clay & Brenham Alley
In Chinatown surrounded by high density commercial and residential uses.

SIZE: 54,773 square feet
The eight largest Downtown park.

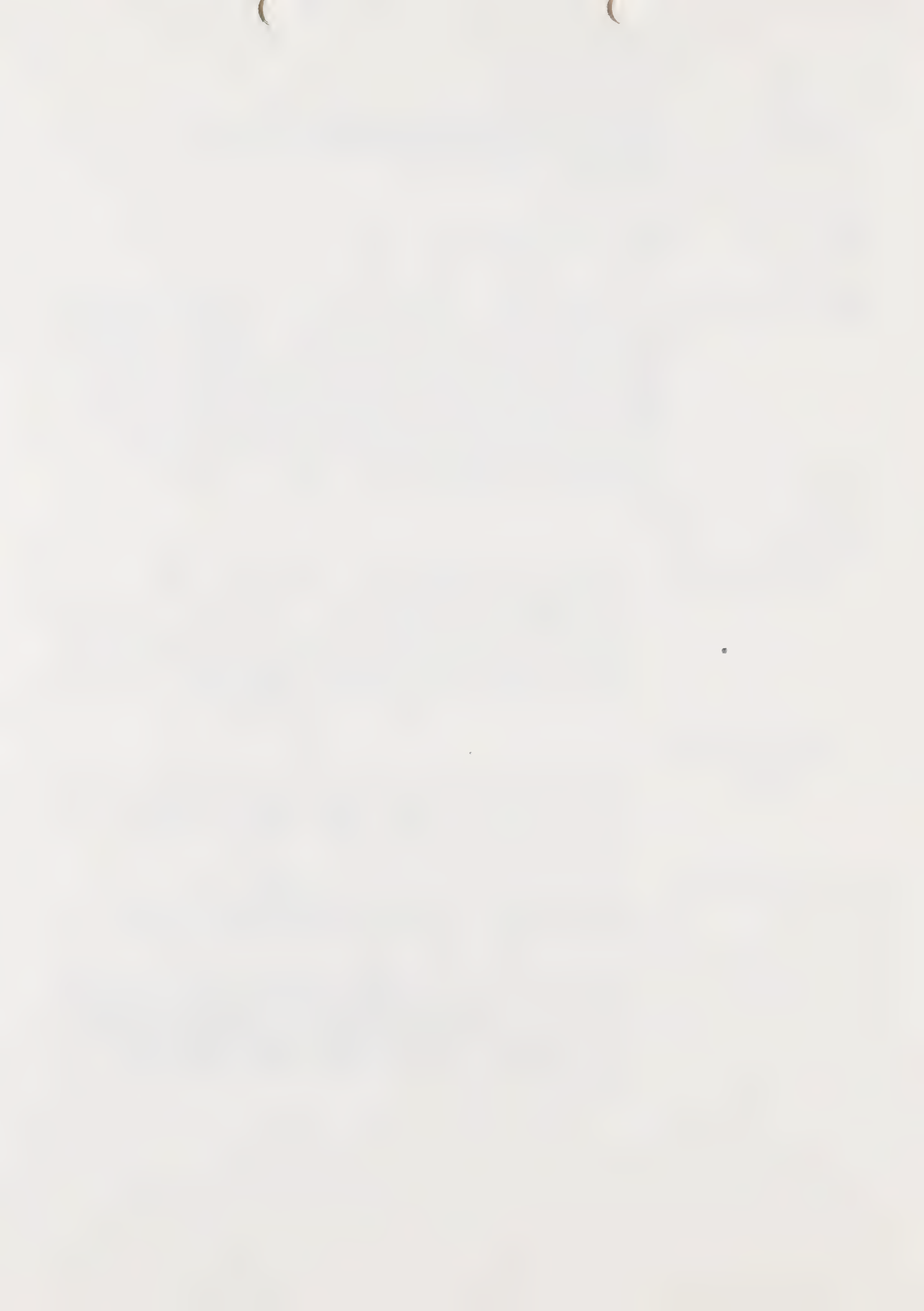
CHARACTERISTICS: A stairway connects the two levels of this Chinatown park. A sky bridge also connects the park to a hotel on Kearny. Within the hotel is a Chinese Cultural Center. A parking facility is located beneath the park. The open space is a major meeting and seating area for residents of Chinatown. Chinese exercise classes are conducted during the morning hours and board games are played throughout the day. Due to the lack of open space in Chinatown the centrally located park is heavily used. A number of tall buildings form the Eastern boarder of the park.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: A relatively sunny park during the entire year - 39% of the annual sun resource is currently in shadow. The shadow profile for this park is generally a "U" shaped curve with heavy shadows in the morning and afternoon during all but the Winter season. During Winter the park receives mid-day shadows changing the shape of the shadow profile to that of a "W" shaped curve.

Seasonal Shadow:

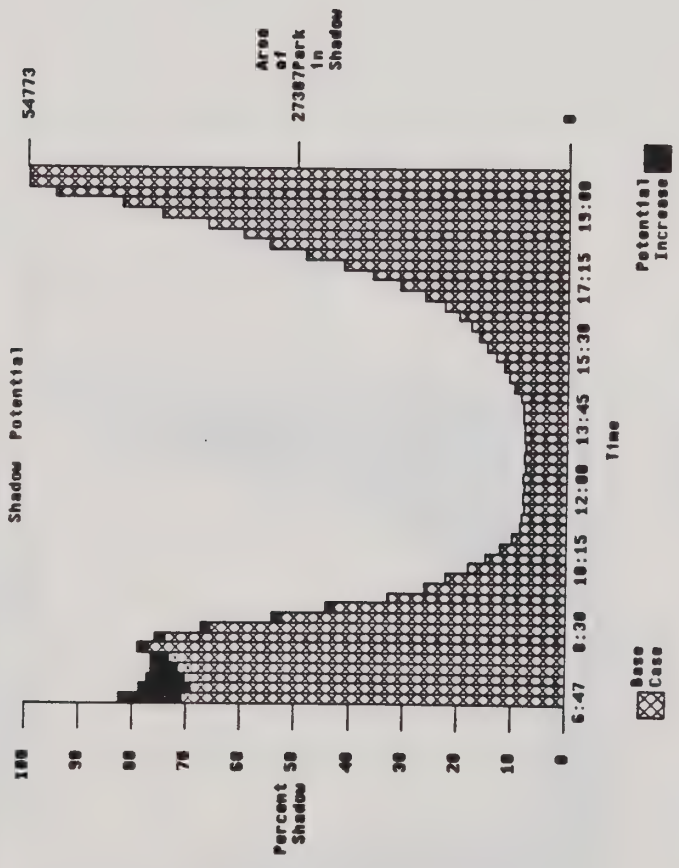
- **Summer:** Less than 10% of the park is in shadows during mid-day hours (10am-2pm). More shadows occur in the afternoon and early morning hours. 35% shadowed during the Summer Solstice.
- **Spring/Fall:** Heavily shadowed before 9:30 am and after 3 pm. An average 10% of the park is in shadows during the mid-day hours. 40% shadowed during the Equinox.
- **Winter:** The shadow pattern during the Winter months is greater relative to other seasons during all times of the day. The park is heavily shadowed during the morning and afternoon with two additional peak shadow hours around 10 am and noon. 55% shadowed during the Winter Solstice.



Portsmouth Square

June 21 1987

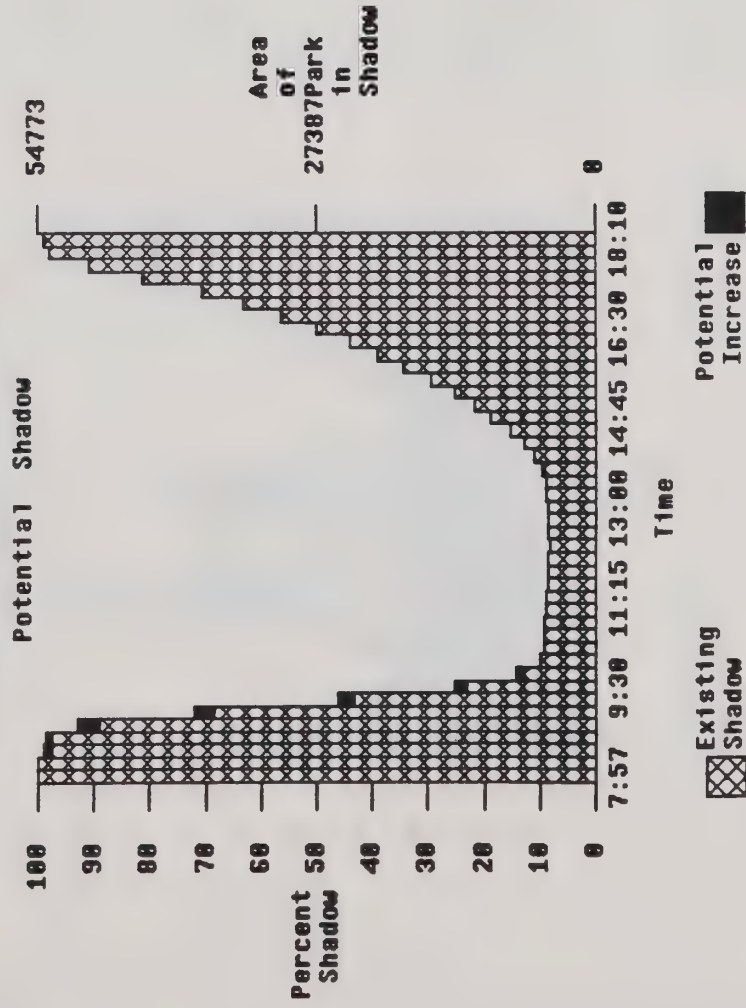
Shadow Potential





Portsmouth Square

September 20, 1987 (March)

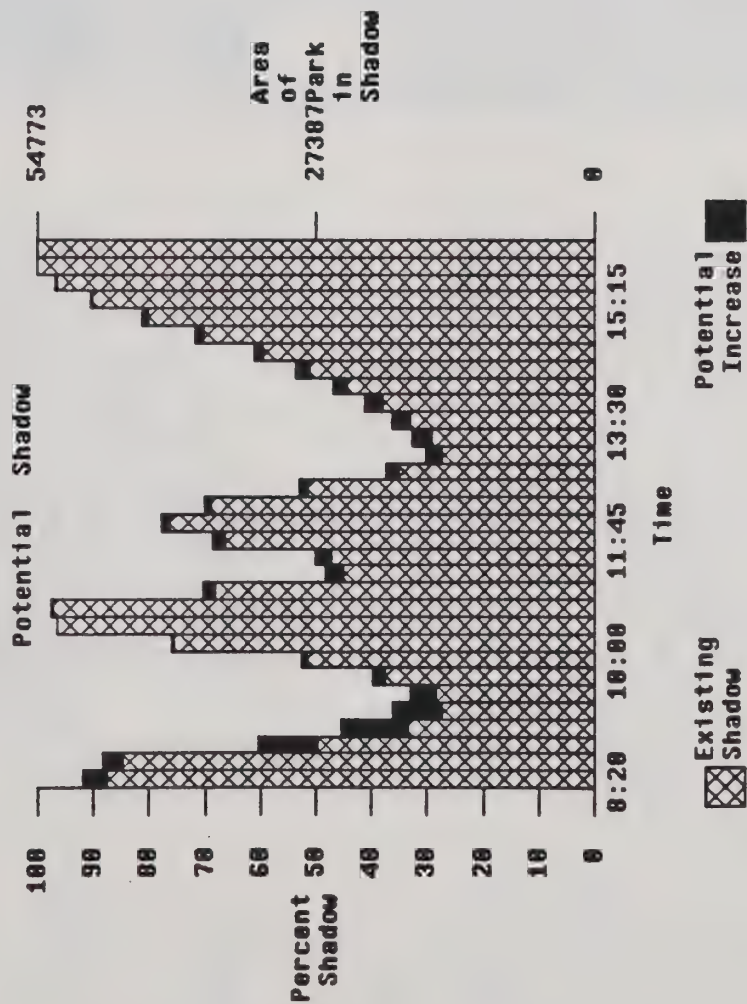


HISTO

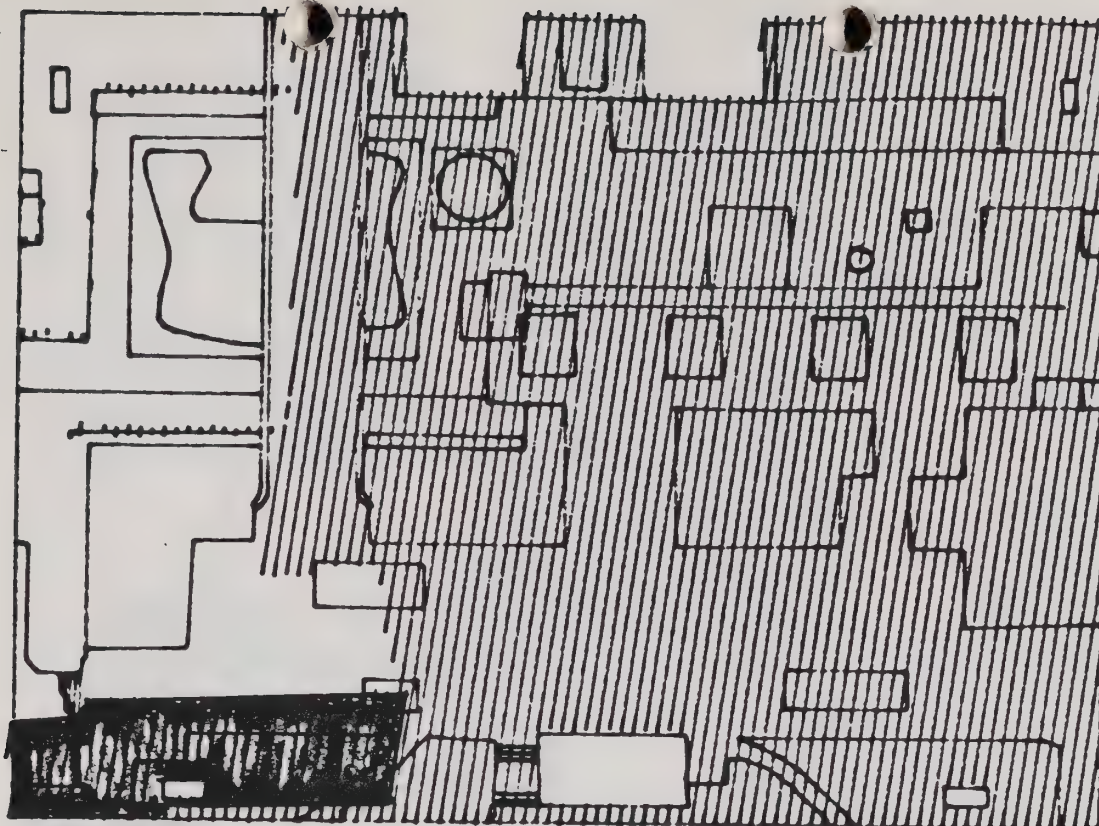
Parameters Histogram Exit

Portsmouth Square

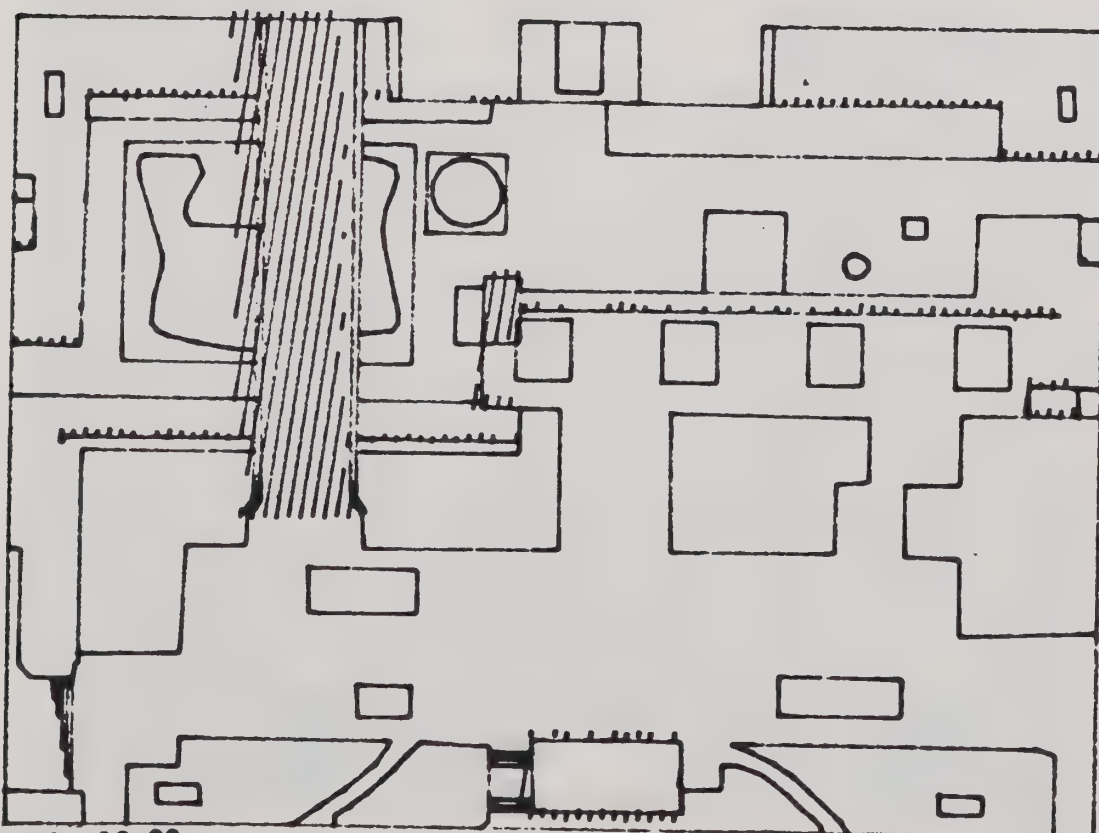
December 20, 1987







6/21 07:30

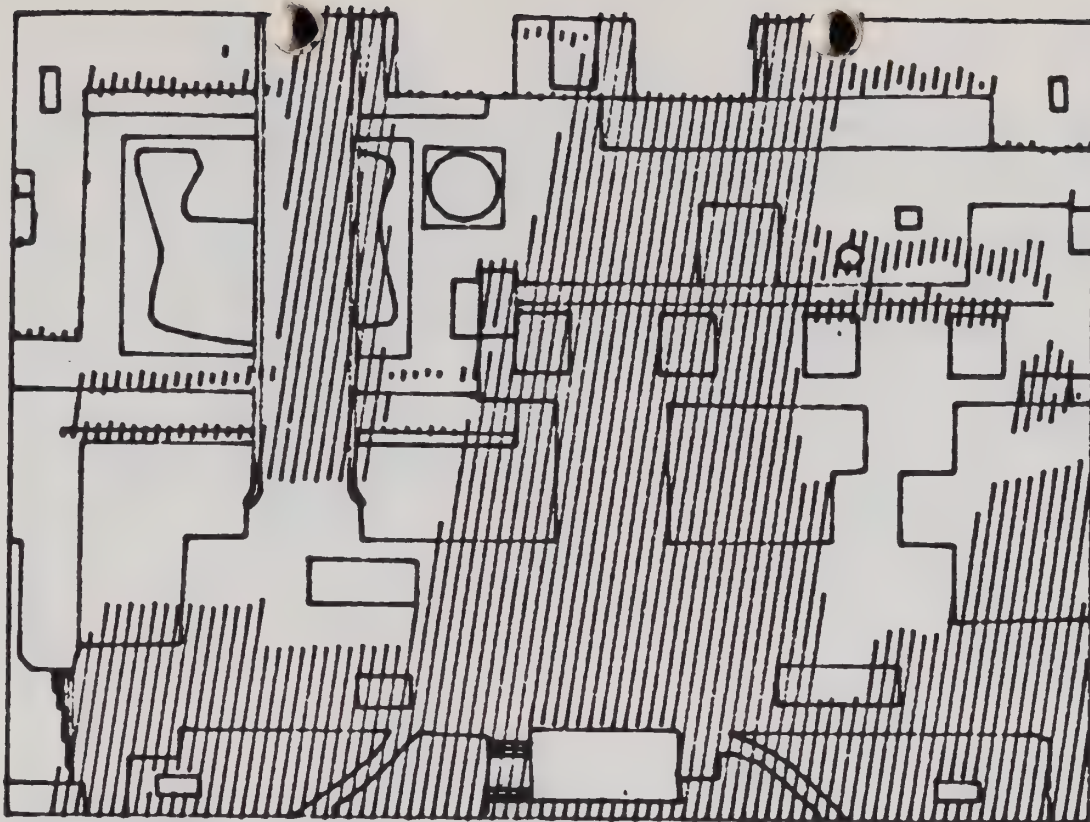


6/21 12:00

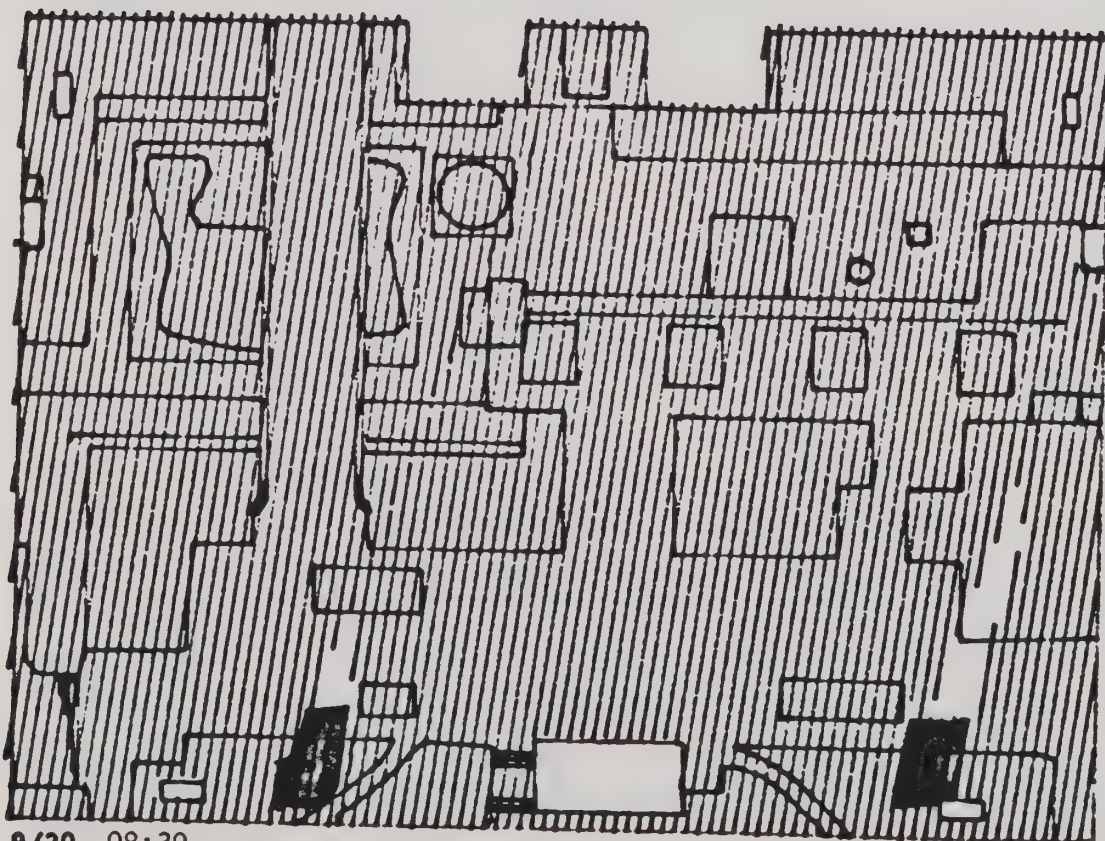
Scale: 1" = 50'

PORTSMOUTH SQUARE







6/21 18:00

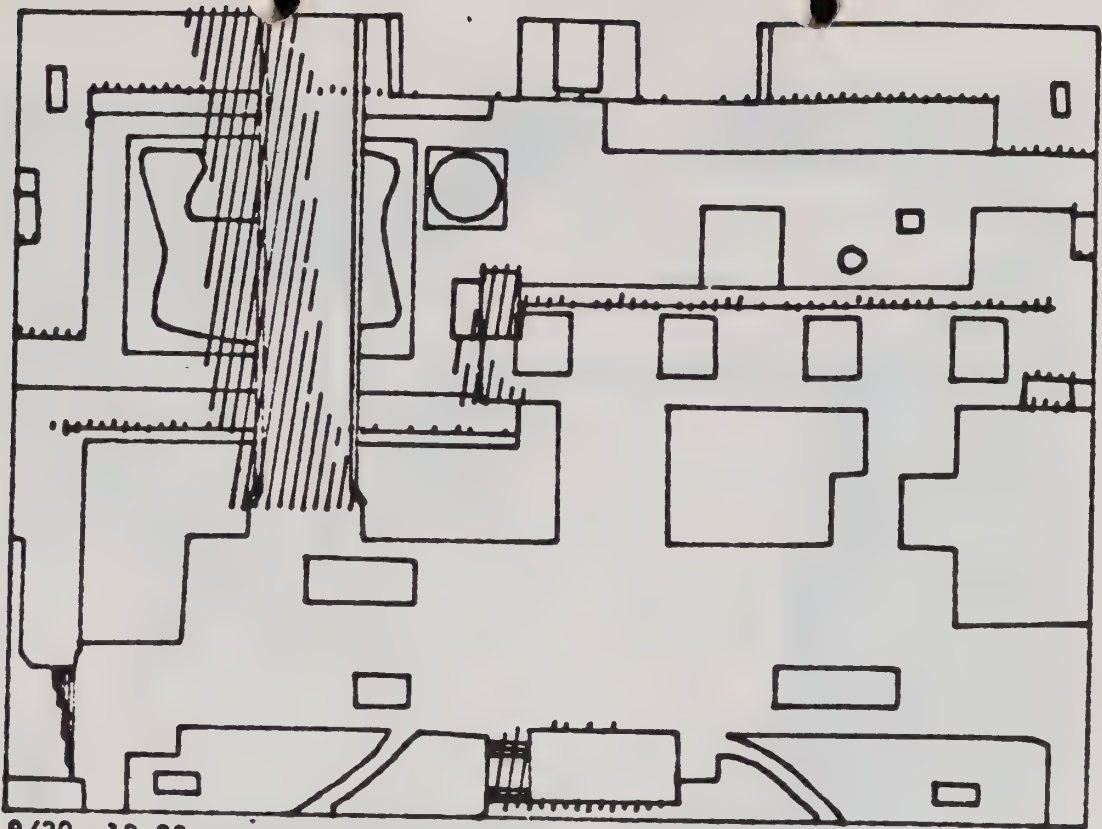


9/20 08:30

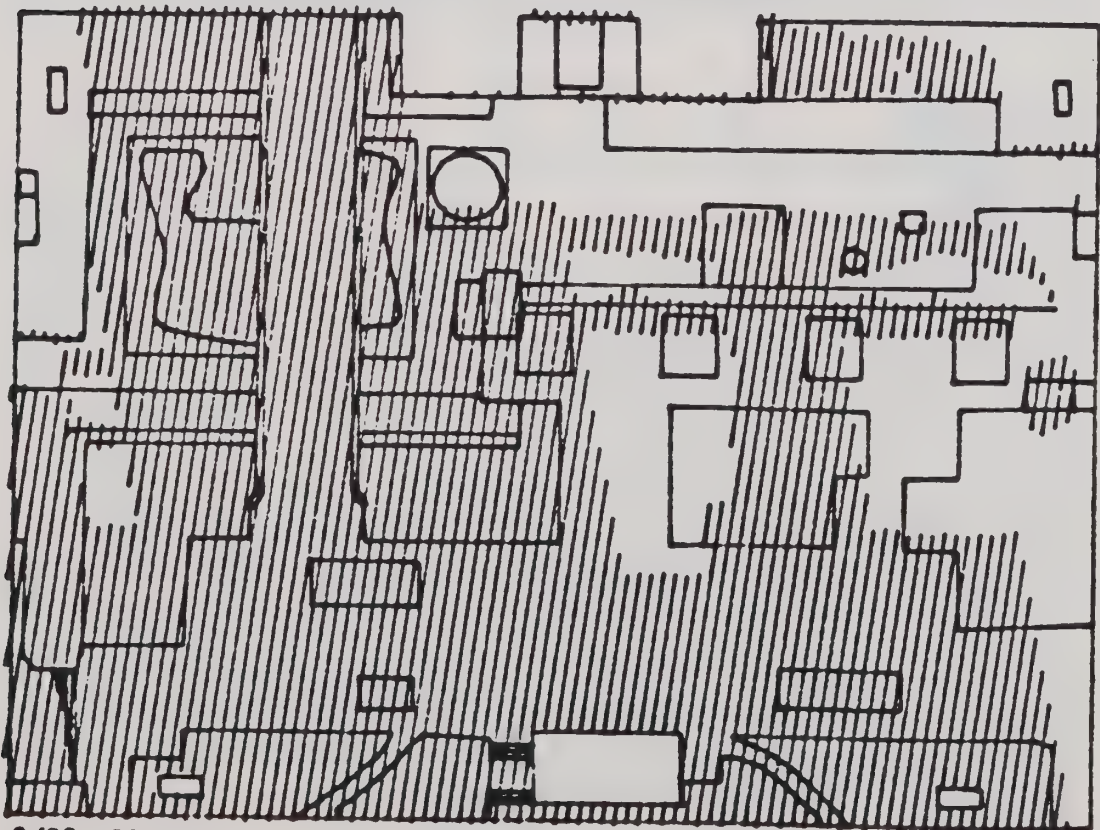
Scale: 1" = 50'

PORTSMOUTH SQUARE

 EXISTING SHADOW
 MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



9/20 12:00



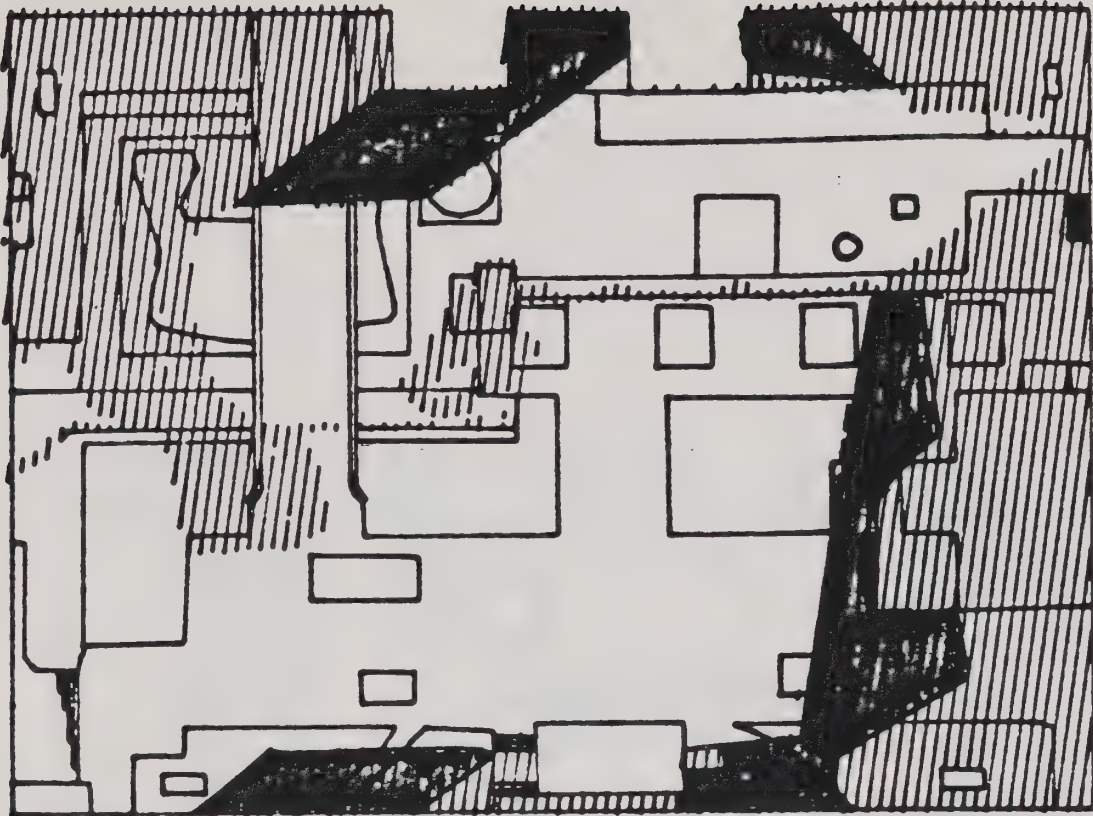
9/20 17:15

Scale: 1" = 50'

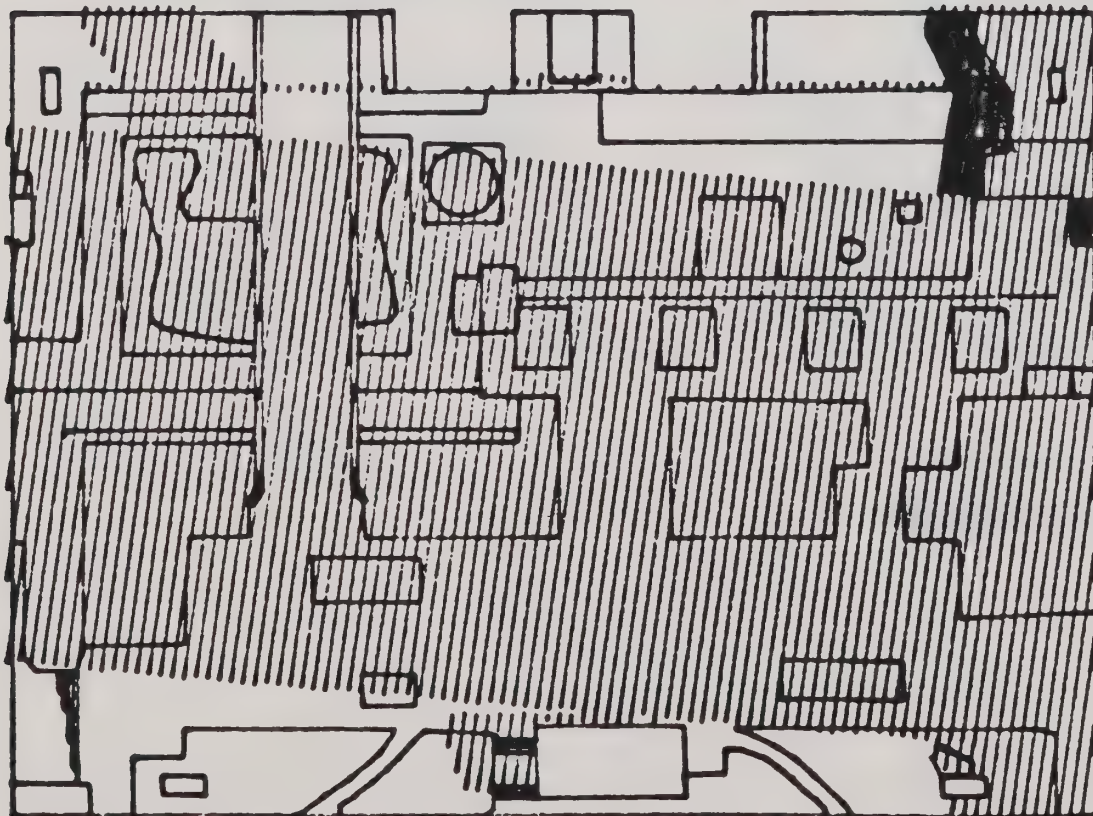
PORTSMOUTH SQUARE

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED







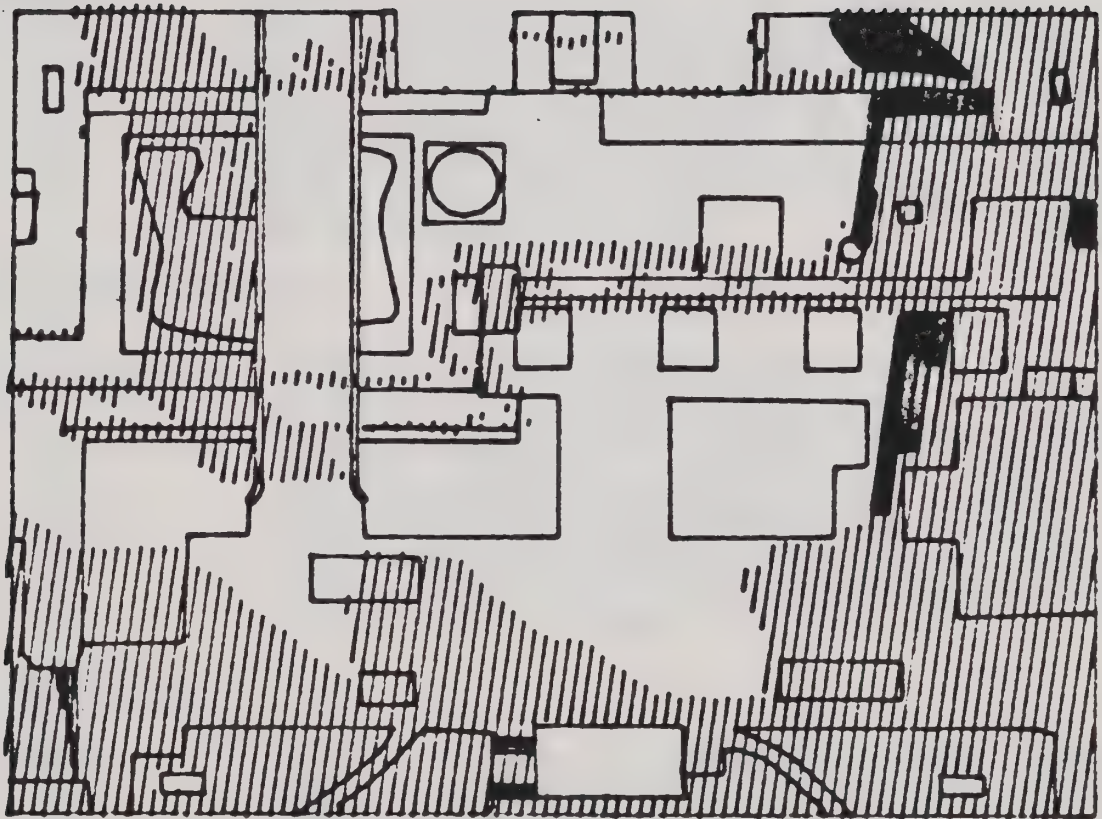
12/20 09:00



12/20 12:00
 Scale: 1" = 50'
 PORTSMOUTH SQUARE

 EXISTING SHADOW
 MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED





12/20 14:15
Scale: 1" = 50'
PORTSMOUTH SQUARE

←
EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: Saint Mary's Square

LOCATION: On Pine & California, between Quincy Alley and Kearny
This park is located in the office and retail district of the downtown area.

SIZE: 46,781 square feet - This square footage includes area designated by the Recreation and Park Department for expansion. The square is a medium sized downtown park, and ranks as the ninth largest of the 15 open spaces.

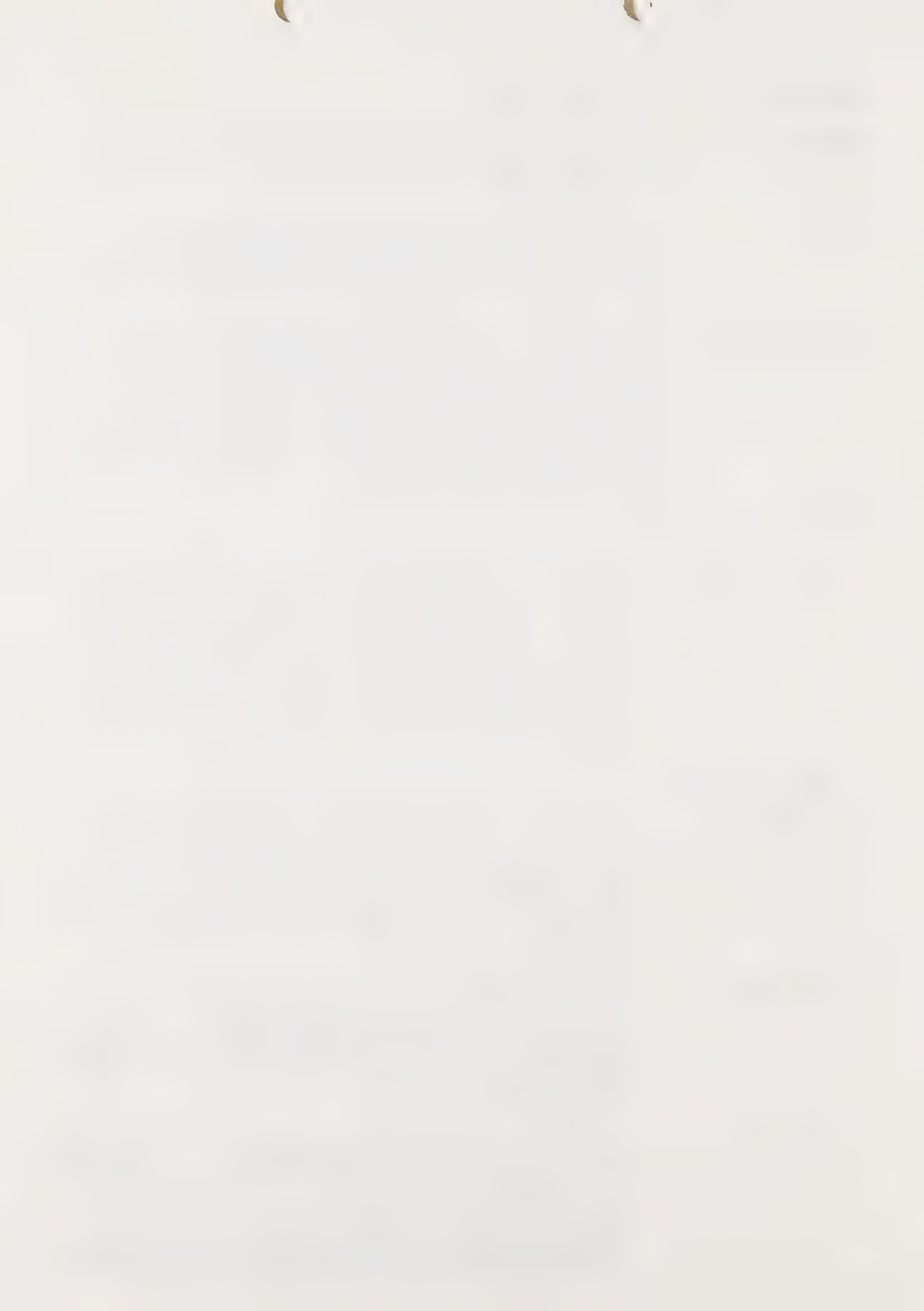
CHARACTERISTICS: The open space is surrounded by predominantly office uses with tall buildings on the East and South. Not very heavily used due to its hidden location and lack of sunlight. The park has no access from the heavily pedestrian traveled Kearny Street. The park entrances located on California and Pine are on a hill and therefore pose some accessibility problems. In the future, a Kearny Street entrance may be provided.

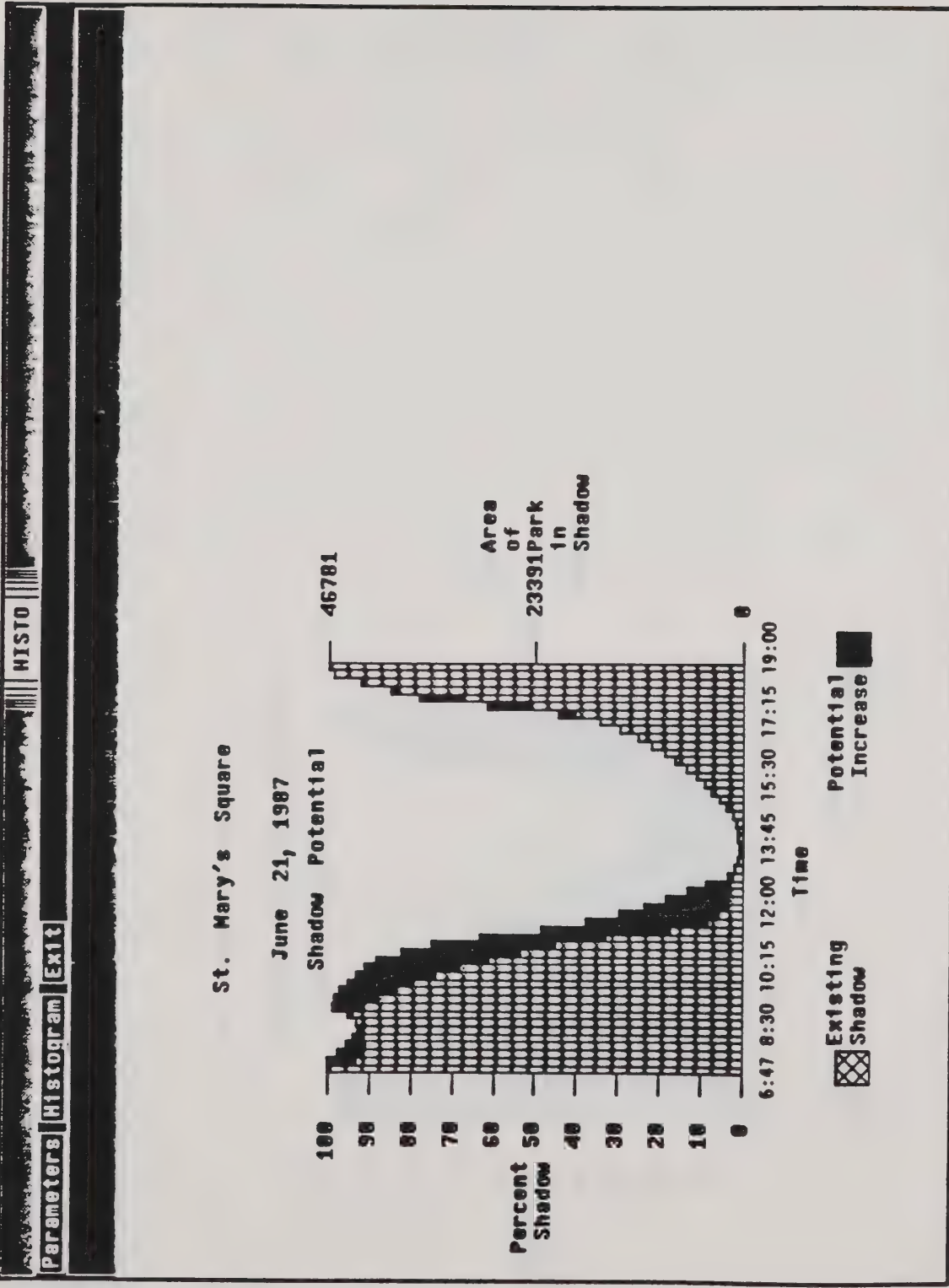
SUN AND SHADOW CONDITIONS:

Yearly Shadow: This park is heavily shaded throughout the year. 51.9% of the annual sun resource for the park is in shadow. Generally, morning shadows are greater than afternoon shadows. During May, June and July the shadow profiles are "U" shaped distributions. For the remainder of the year, the mid-day shadows increase and the shadow profiles become "W" shaped. The mid-day peak in the shadow profiles result from shadows cast by buildings to the South of the park.

Seasonal Shadow:

- Summer: The park is mostly in shade during the early morning and late afternoon hours. The least amount of shade occurs between the hours of 11am and 3pm. Toward the end of Summer the noon shadows increase. At the time of Summer solstice (around June 21st) nearly 40% of the total foot-hours for the park are in shade during the Proposition K hours.
- Spring/Fall: Except for one hour in the morning (around 10am) and one hour in the afternoon (around 3pm) the park is heavily shaded. Hourly shadows increase as Winter proceeds until the equinox (around March and September 20th) when close to 45% of the park is shaded during Proposition K hours.
- Winter: The shadow pattern of Fall also apply during the Winter with an even greater increase in shadows. The minimum shade impacts on the park occur during late morning, noon and early afternoon hours. For one hour around 10am and two hours around 2:30pm the park has the greatest amount of sunlight. Around December 20th (Winter solstice) approximately 70% of the park would be in shade during the Proposition K hours.



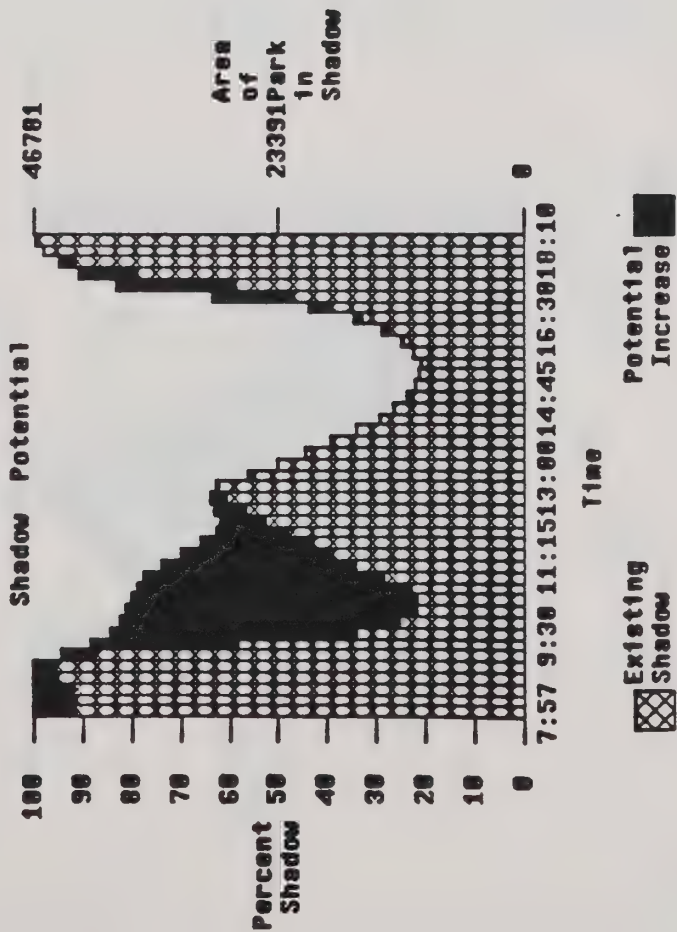


HISTO

Parameters Histogram Exit

St. Mary's Square

September 20, 1987 (March)





HISTO

Parameters Histogram Exit

St. Mary's Square

December 28, 1987

Shadow Potential

46781

Area
of
Park
in
Shadow

Percent
Shadow

100
90
80
70
60
50
40
30
20
10
0

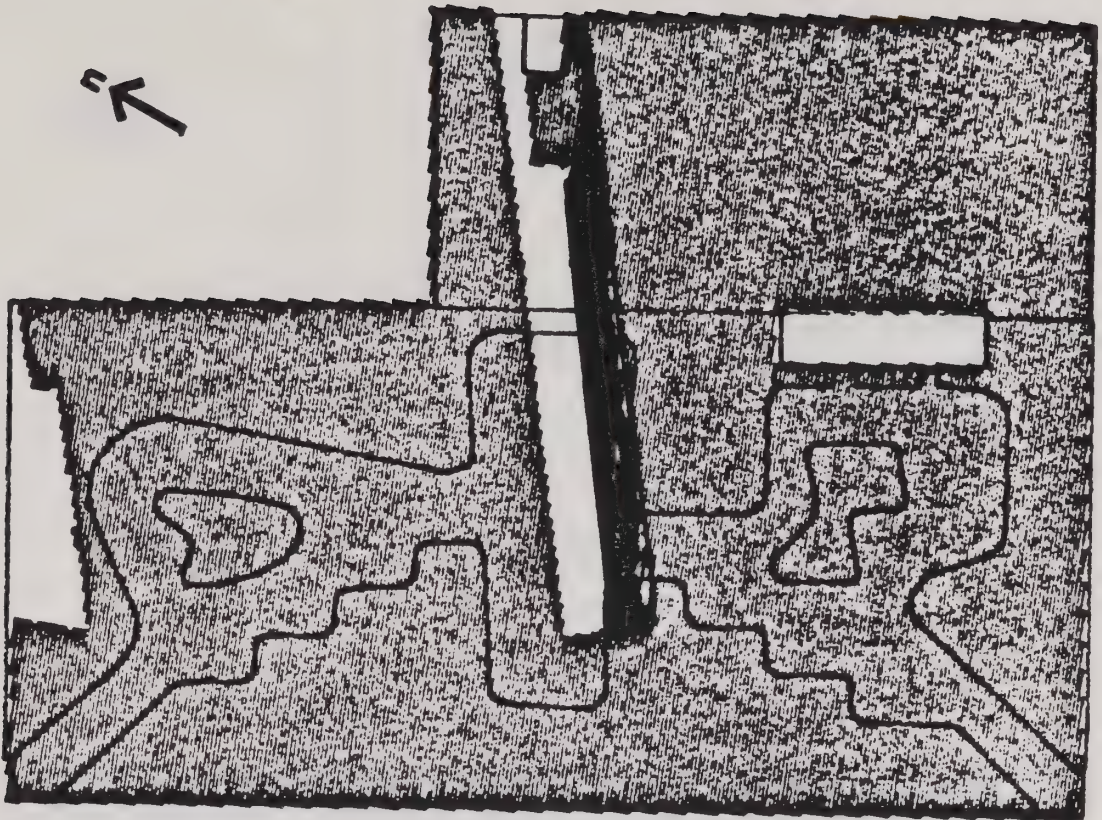
8:20 10:00 11:45 13:30 15:15

Time

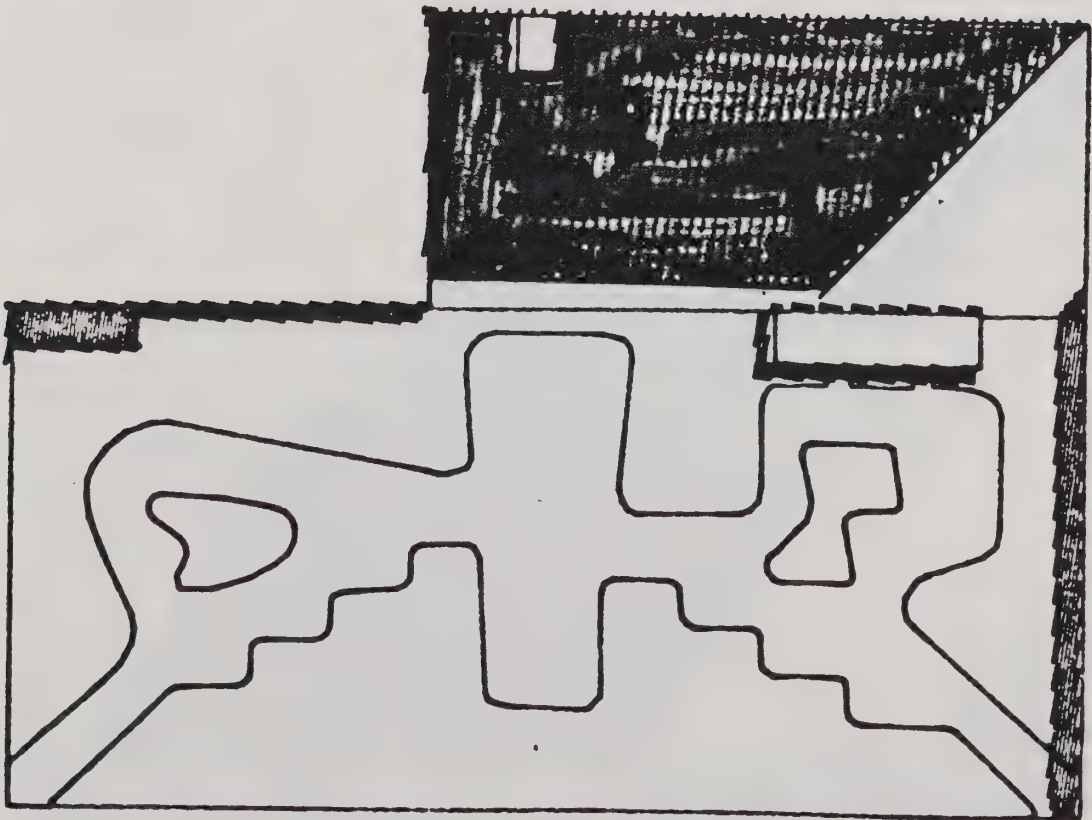
Existing
Shadow

Potential
Increase

0





6/21 07:45

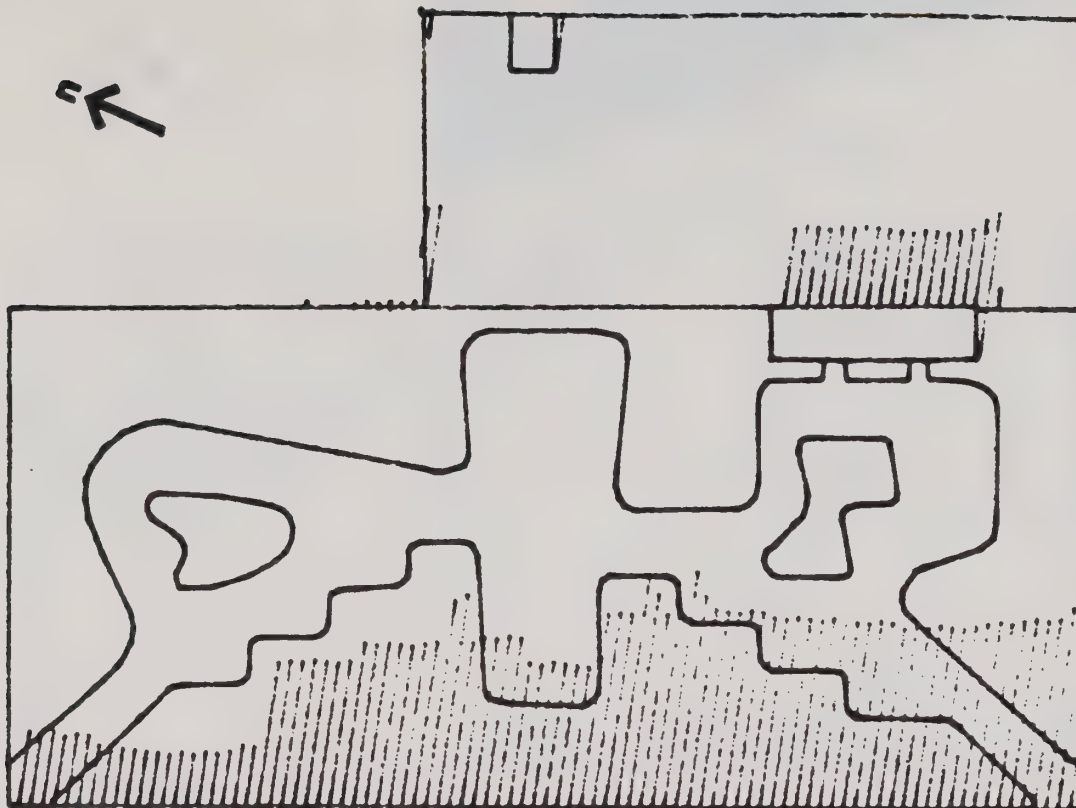


6/21 12:00
Scale: 1" = 50'

ST. MARY'S SQUARE

 EXISTING SHADOW
 MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED





6/21 17:30




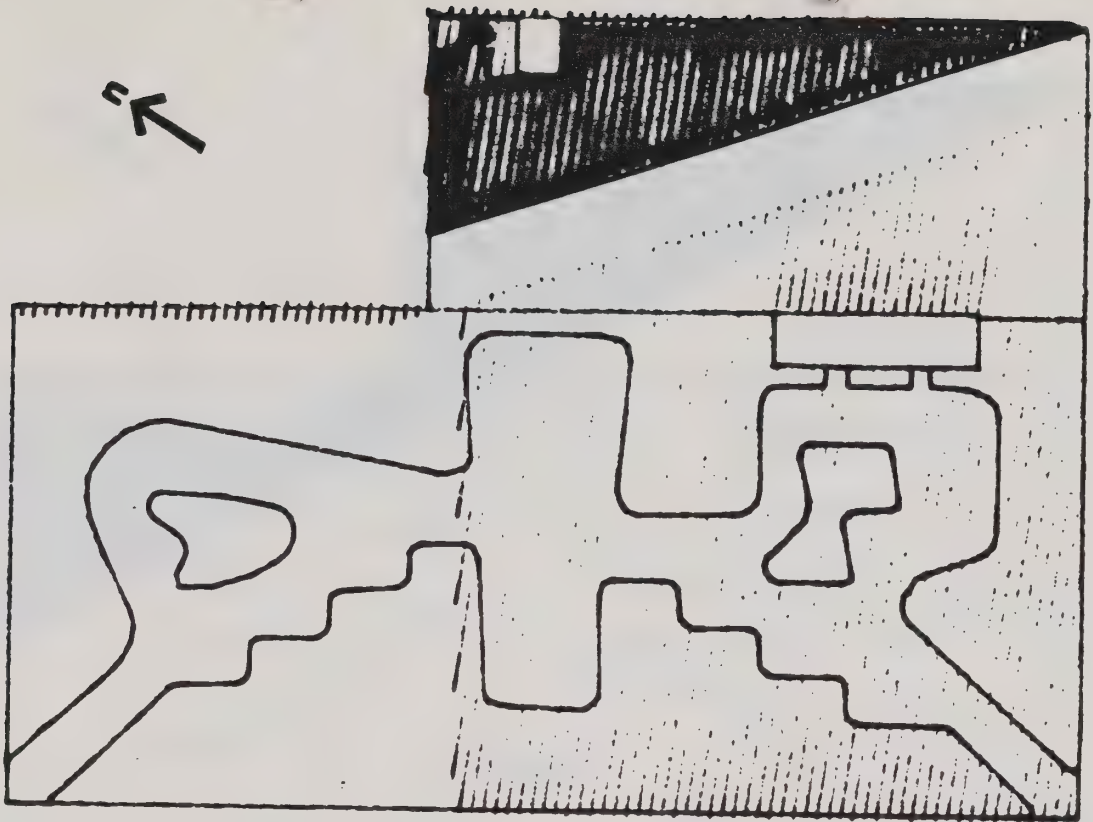
9/20 09:30

Scale: 1" = 50'

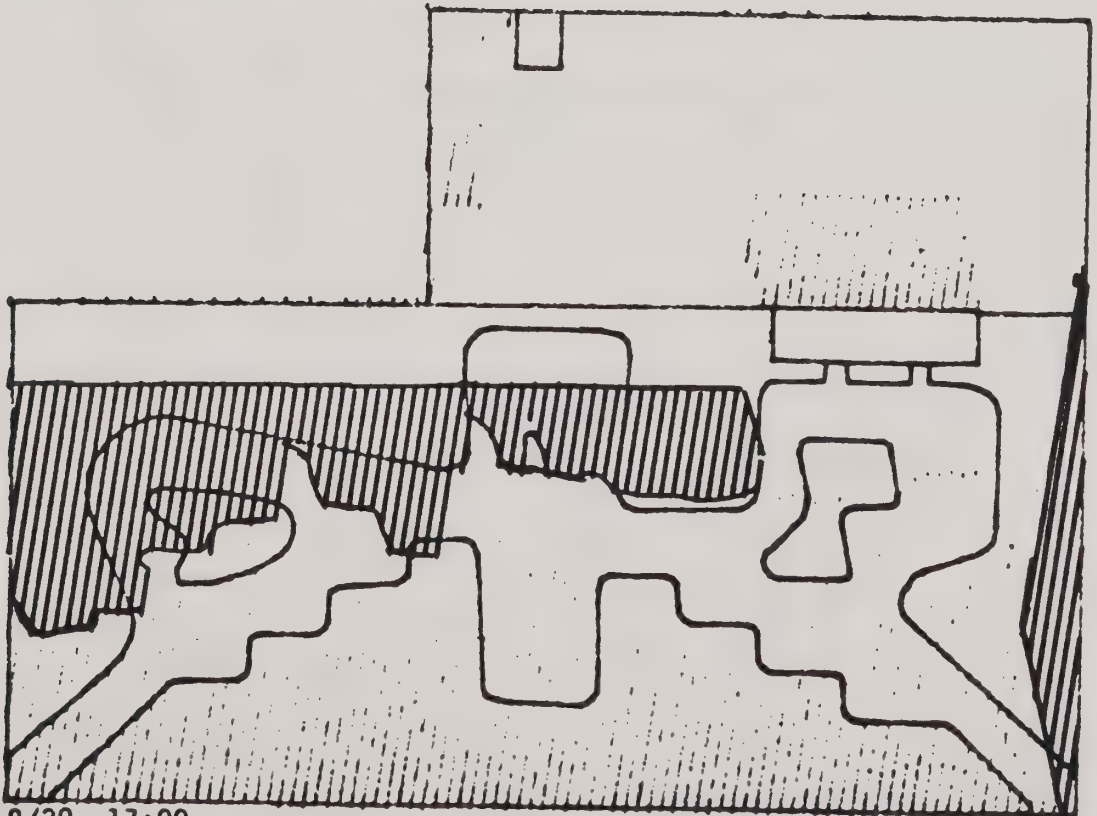
ST. MARY'S SQUARE

 EXISTING SHADOW

 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED





9/20 12:00

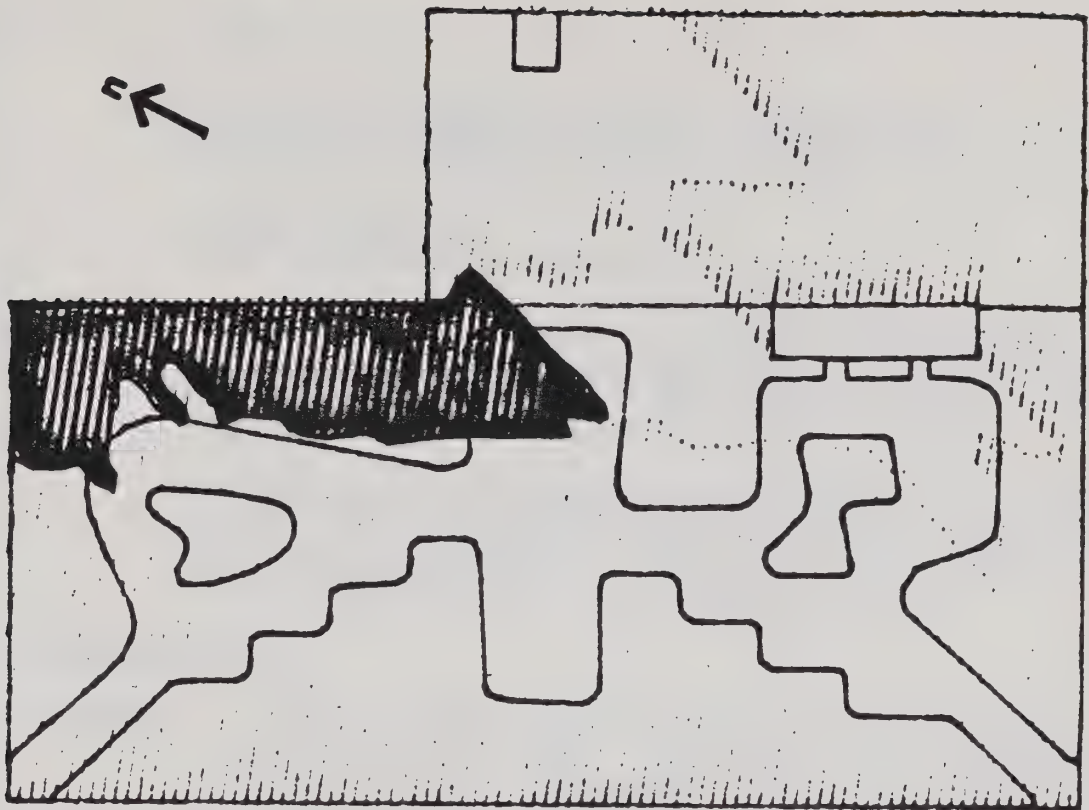


9/20 17:00

Scale: 1" = 50'

ST. MARY'S SQUARE

 EXISTING SHADOW
 MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



12/20 15:00
Scale: 1" = 50'

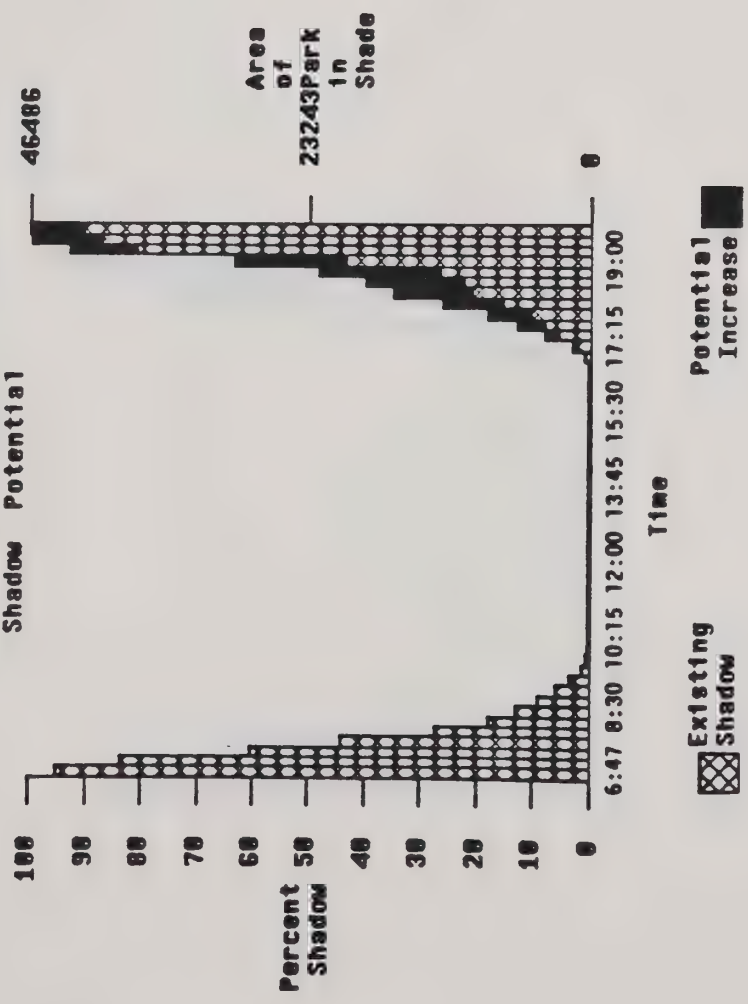
ST. MARY'S SQUARE

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

Huntington Park

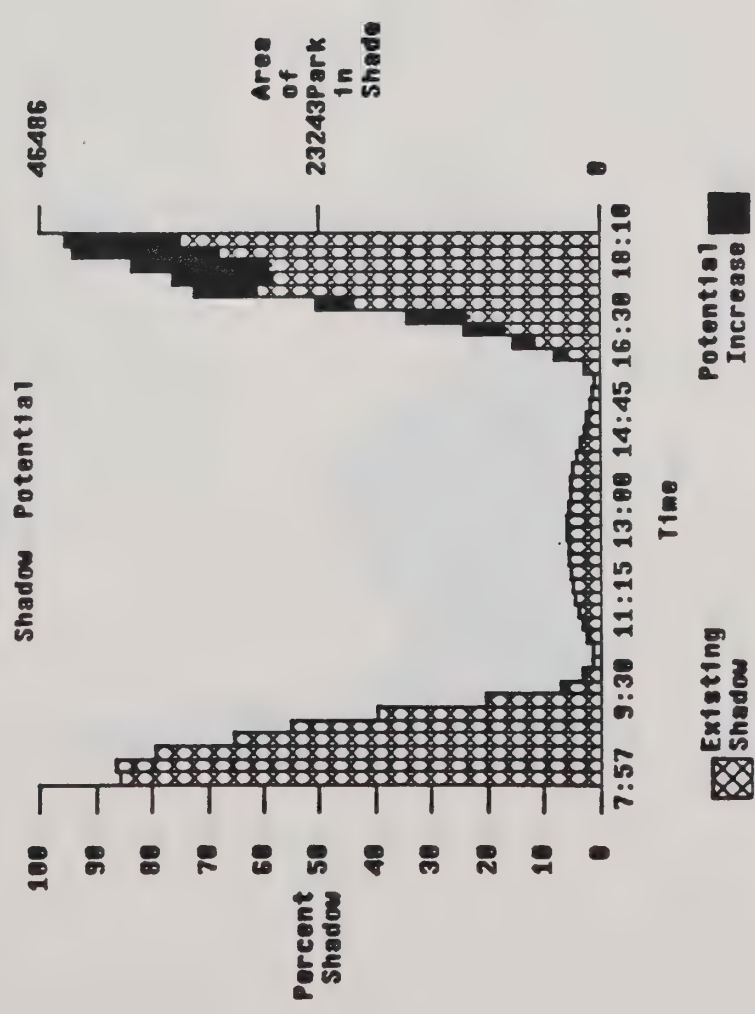
June 21, 1987

Shadow Potential



Huntington Park

September 20, 1987 (March)

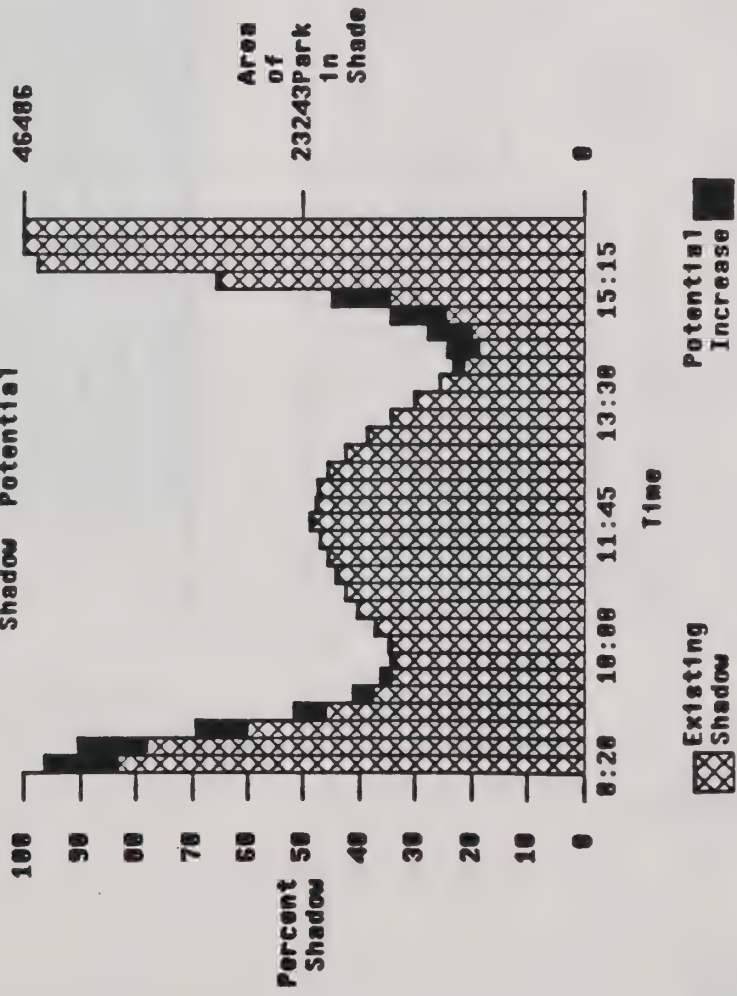


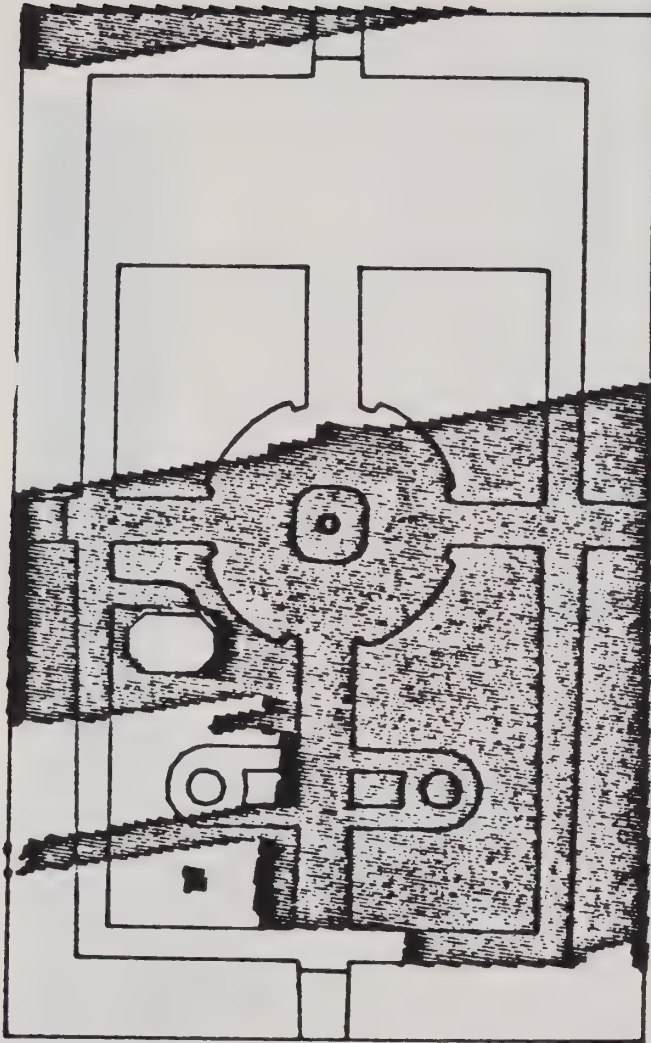


Huntington Park

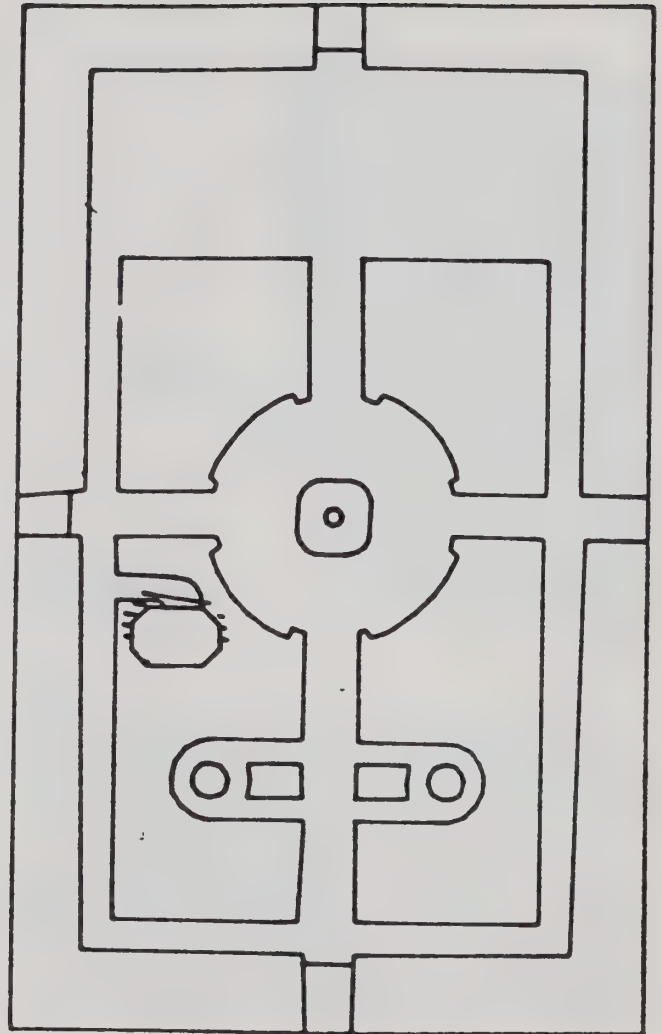
December 20, 1987

Shadow Potential





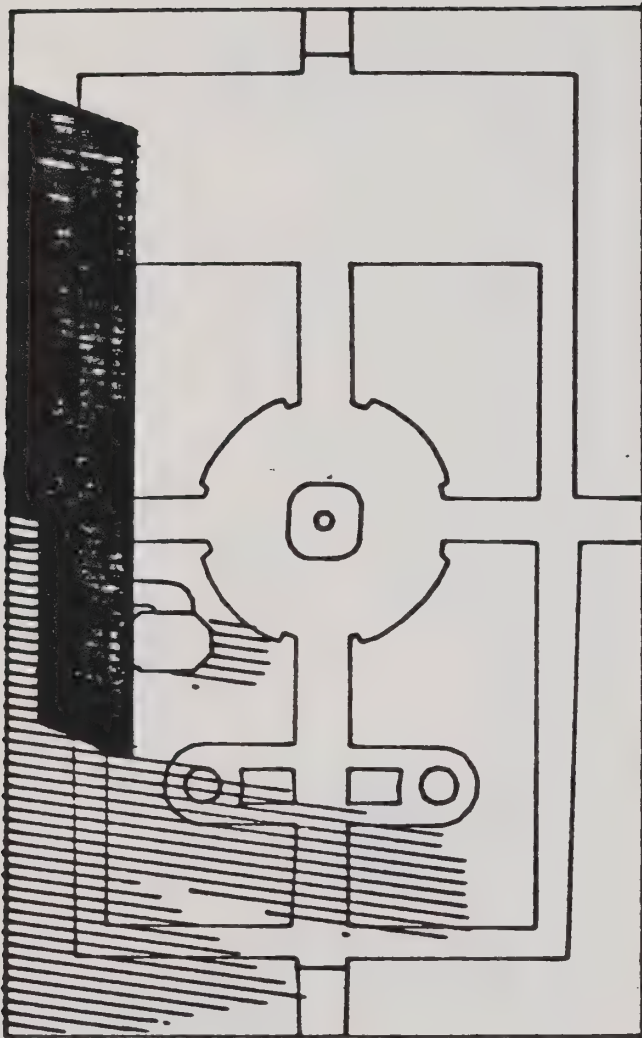


6/21 07:30
Scale: 1" = 50'

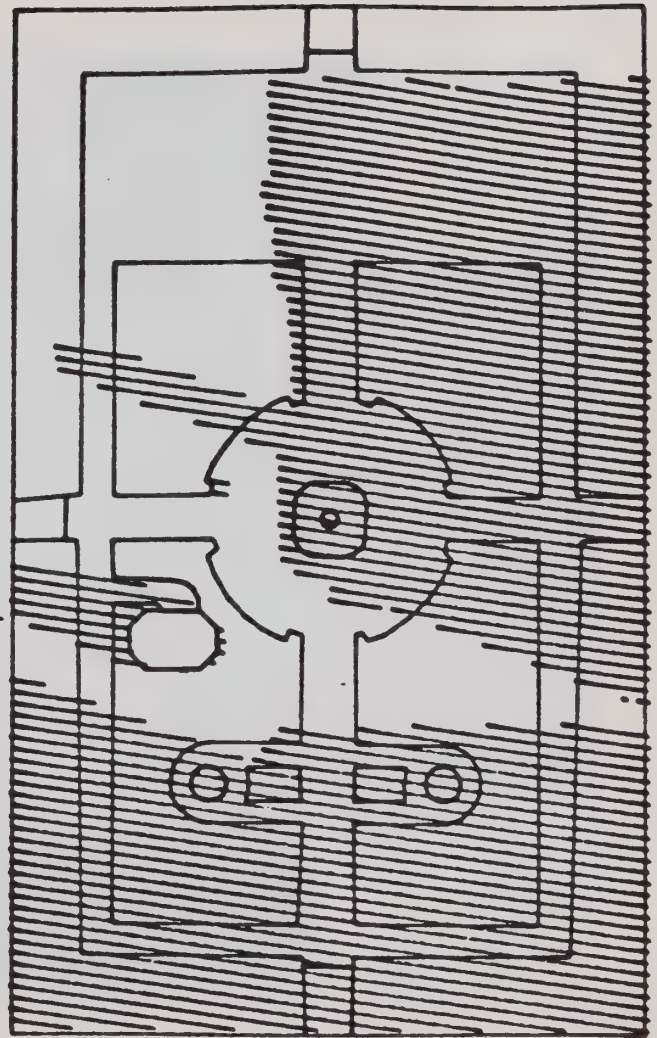


6/21 12:00
HUNTINGTON PARK



 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

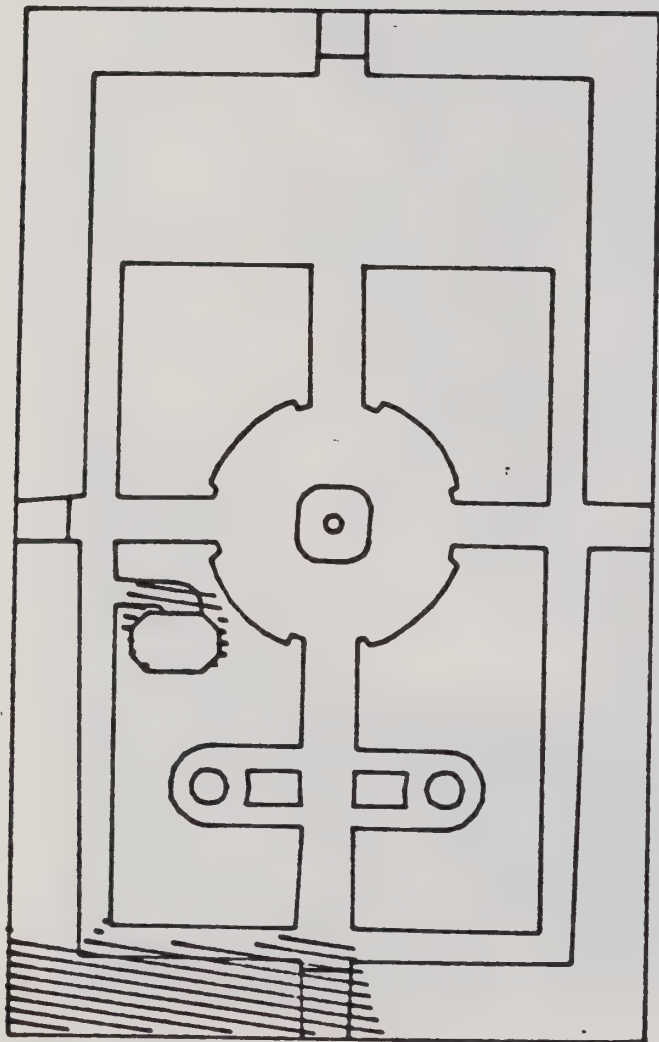


6/21 18:00
Scale: 1" = 50'

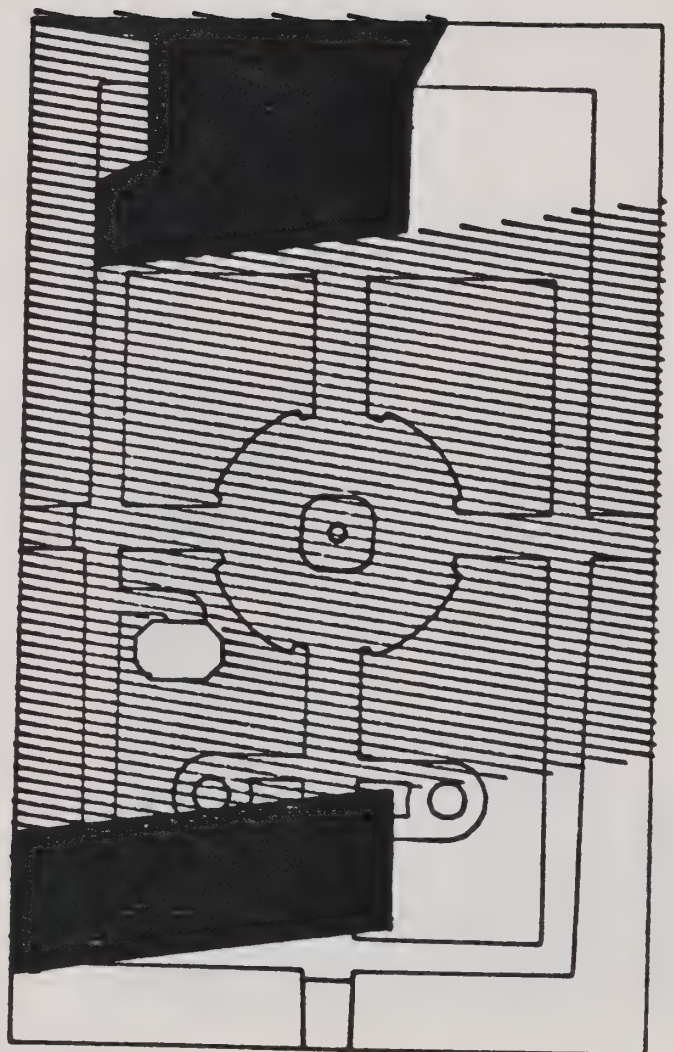


9/20 08:30
HUNTINGTON PARK

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

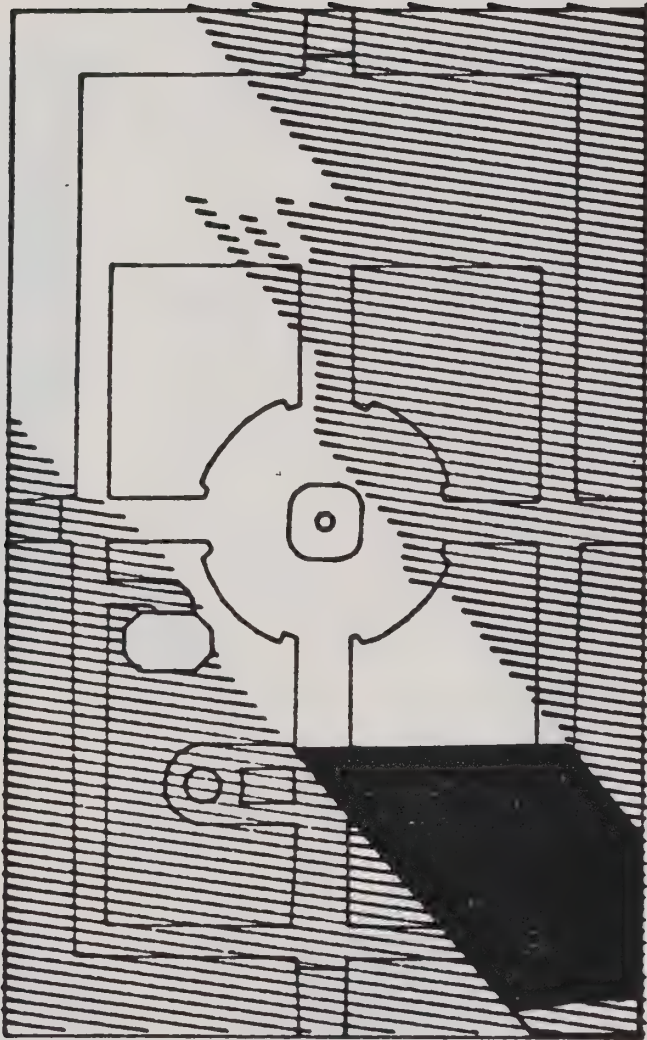


9/20 12:00
Scale: 1" = 50'

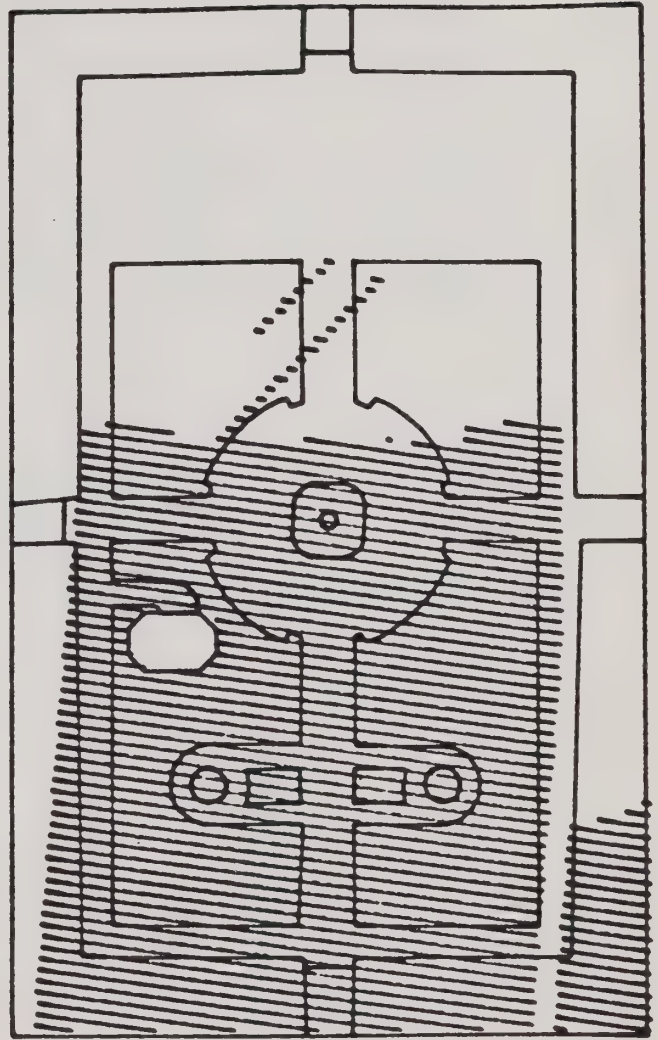


9/20 17:30
HUNTINGTON PARK



EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

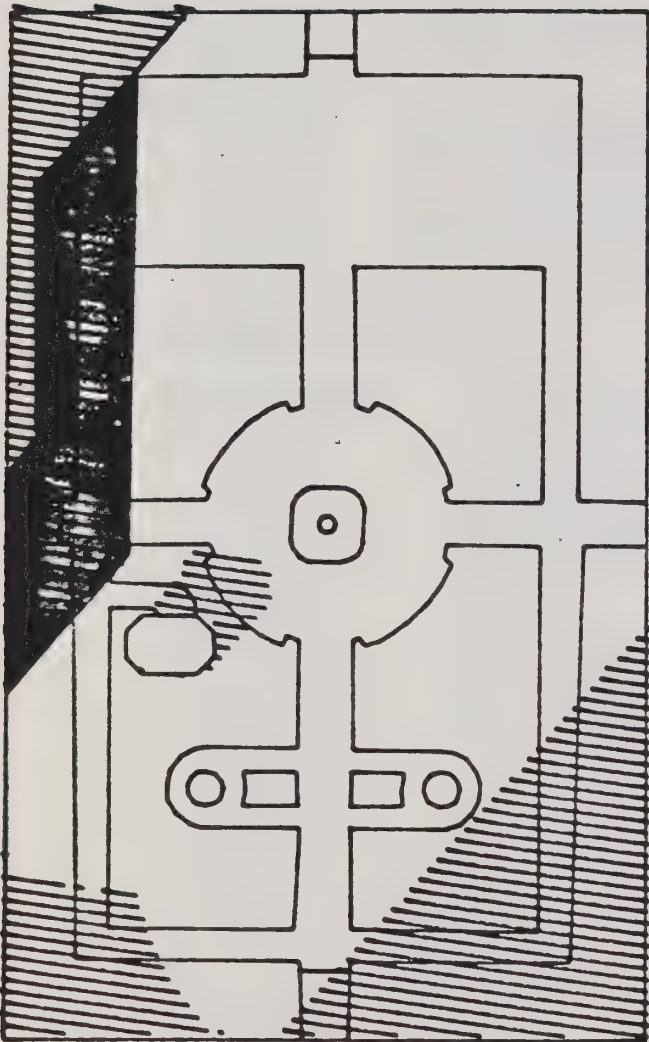


12/20 08:45
Scale: 1" = 50'





12/20 12:00
HUNTINGTON PARK

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



12/20 14:30
Scale: 1" = 50'

HUNTINGTON PARK

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: South of Market Park

LOCATION: The north-western corner of the intersection of Folsom and Sixth Street. The park is surrounded by low rise residential, retail and light industrial uses.

SIZE: 44,940 square feet
This is the fifth smallest Downtown park.

CHARACTERISTICS: This park is currently under development, fenced and not open to the public. The parks location is in the South of Market Residential Hotel District. At this time there is not a great deal of pedestrian traffic on the streets surrounding the park. Buildings surrounding the park are typically between two and four stories.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: The park is sunny throughout the year except during late afternoon hours. 7.3% of the annual sun resource for this park is currently in shadows. Very little shading occurs during the morning hours and shadows do not increase to more than 5% of the park until 3pm. This shadow pattern continues throughout the four seasons.

2% Summer Solstice
2% Fall Equinox
4% Winter Solstice

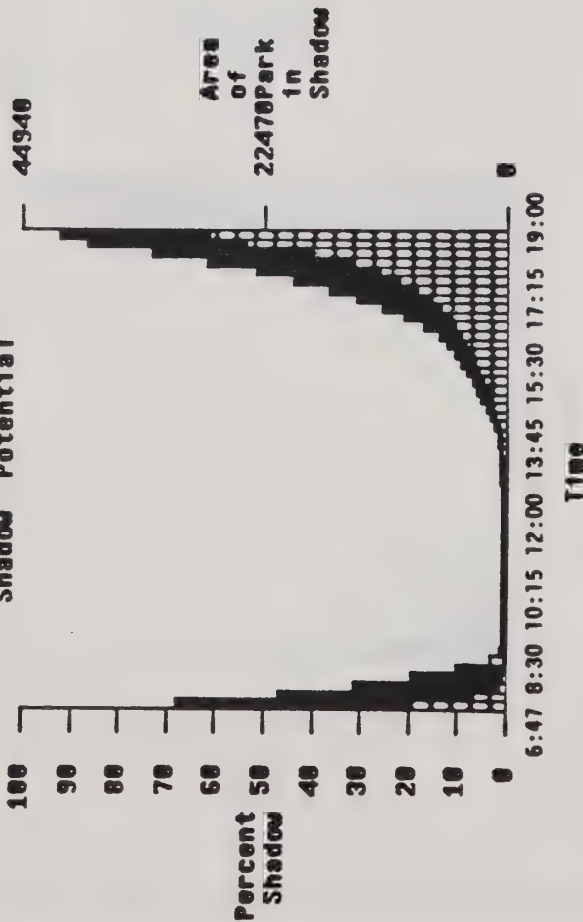
HISTO

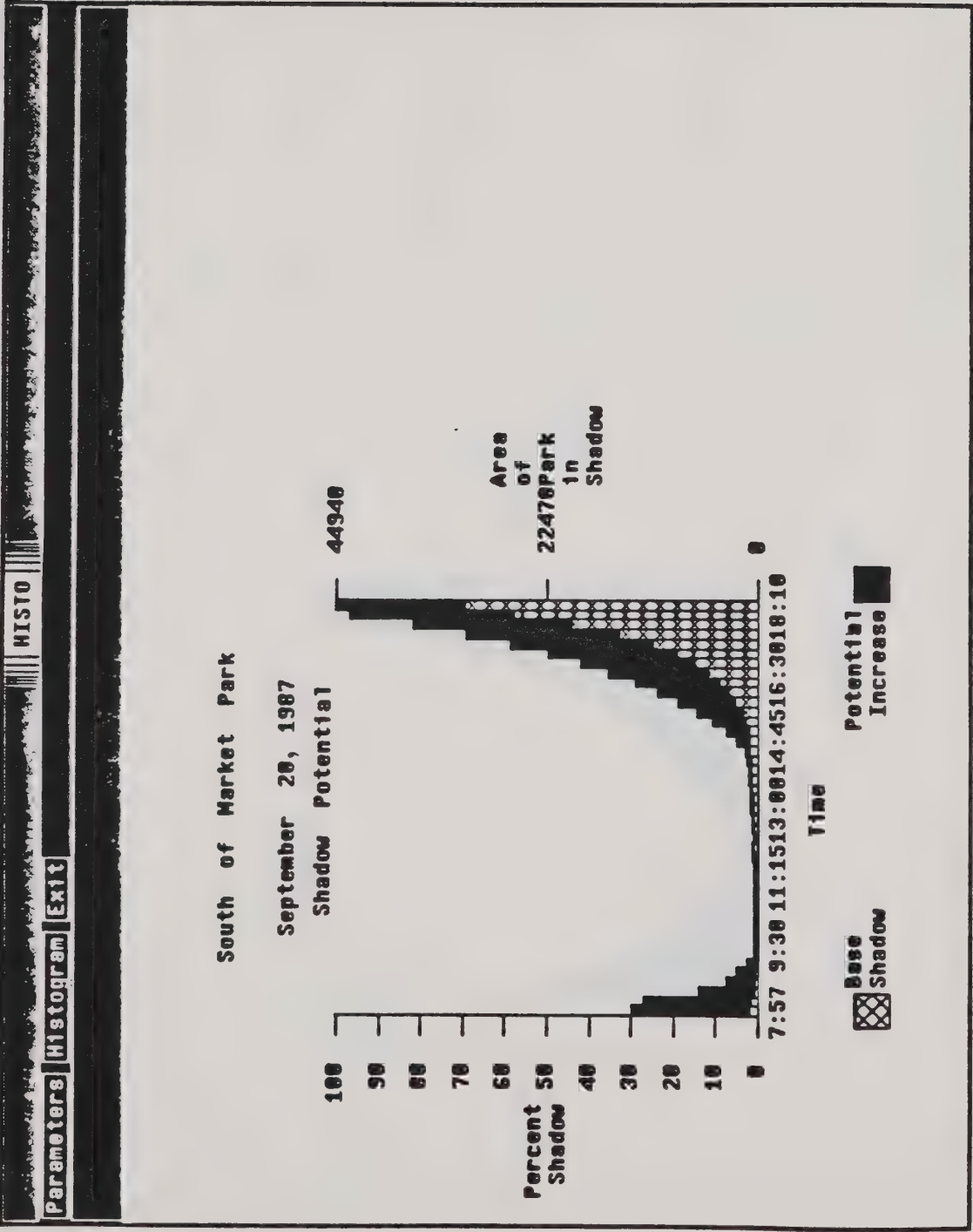
Parameters Histogram Exit

South of Market Park

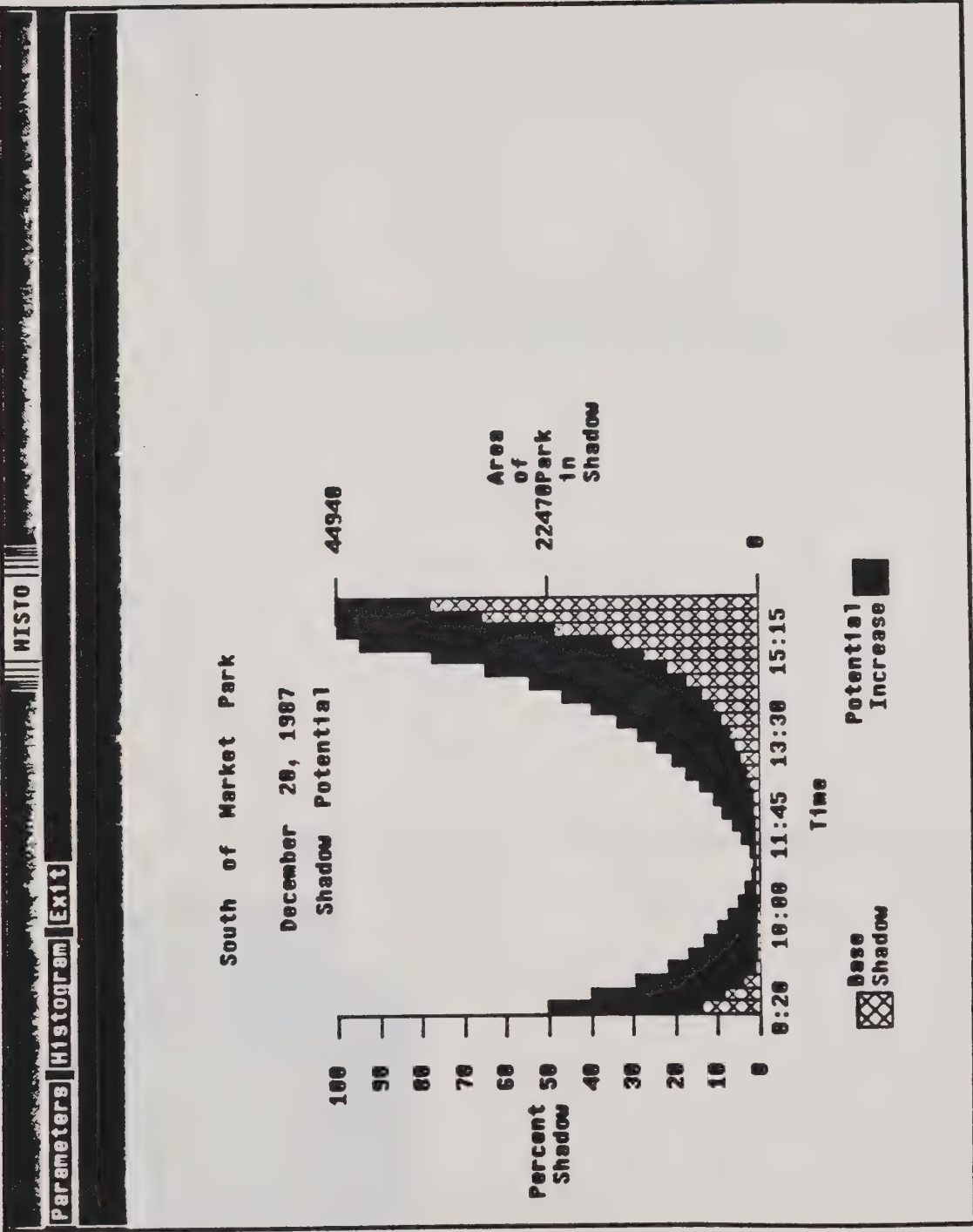
June 21, 1987

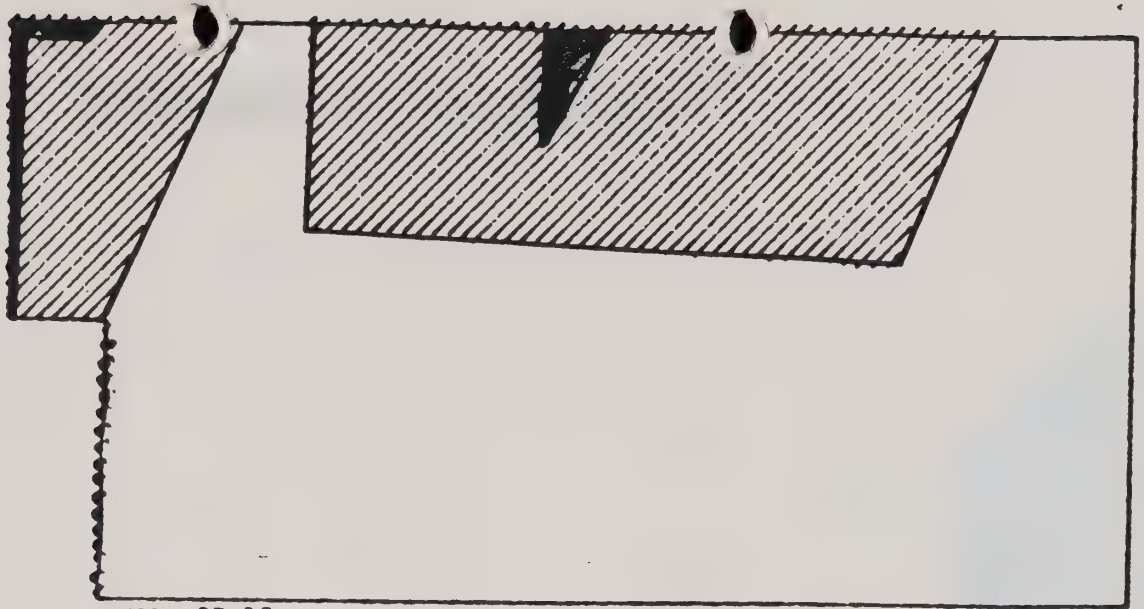
Shadow Potential



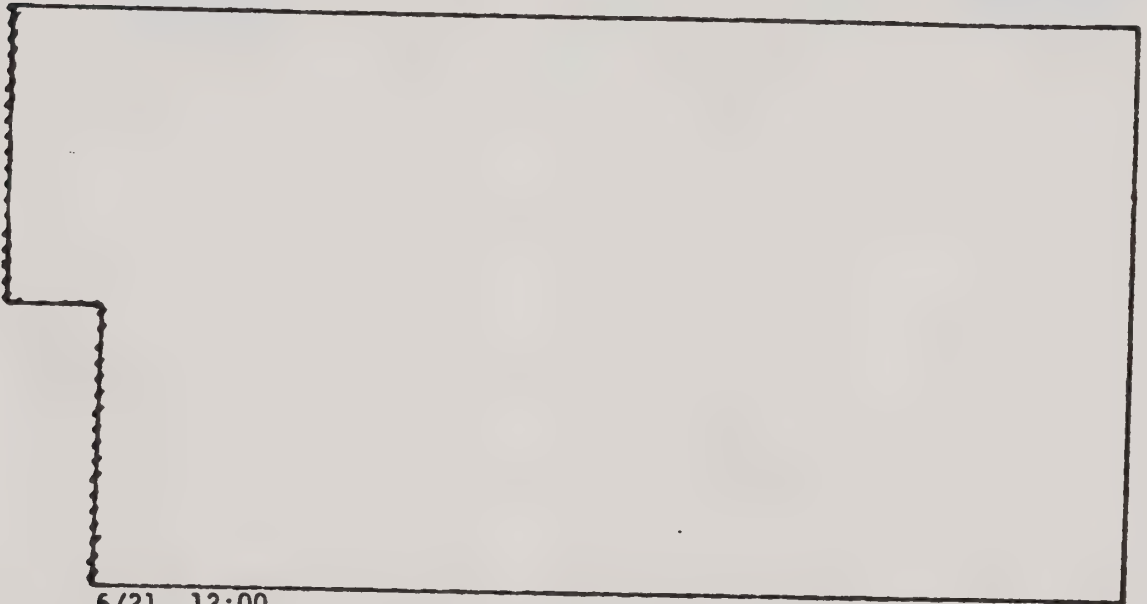




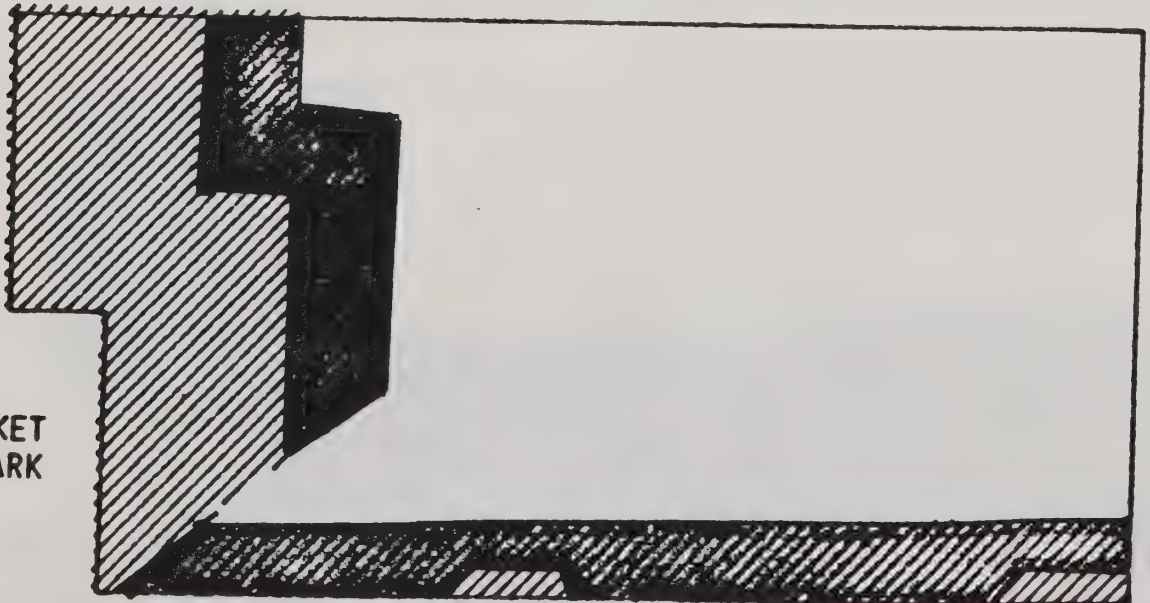




6/21 07:15





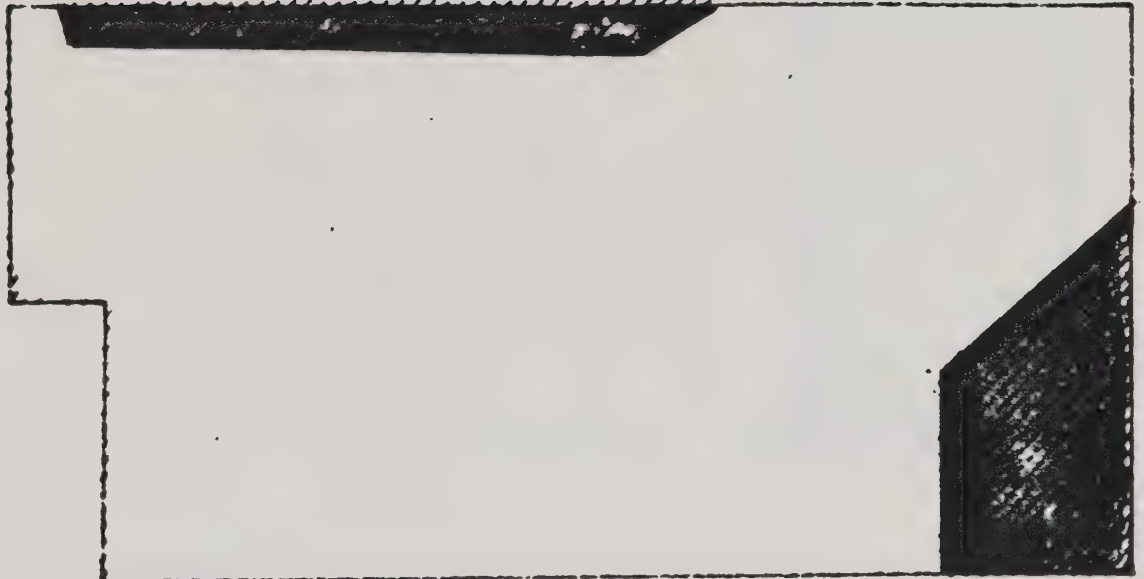
6/21 12:00



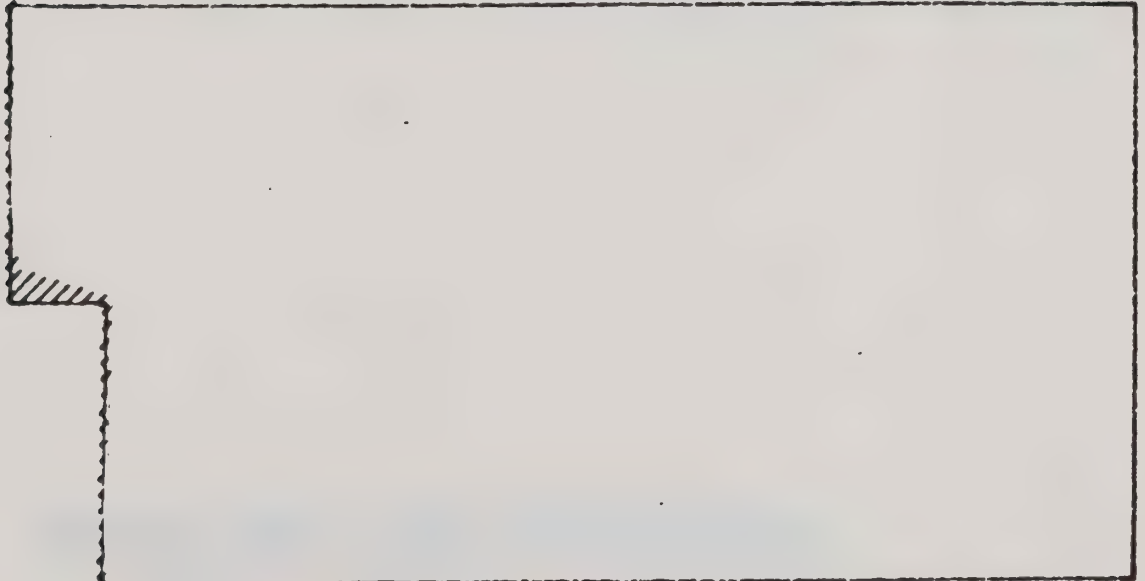
SOUTH OF MARKET
PARK

6/21 18:15
Scale: 1" = 50'

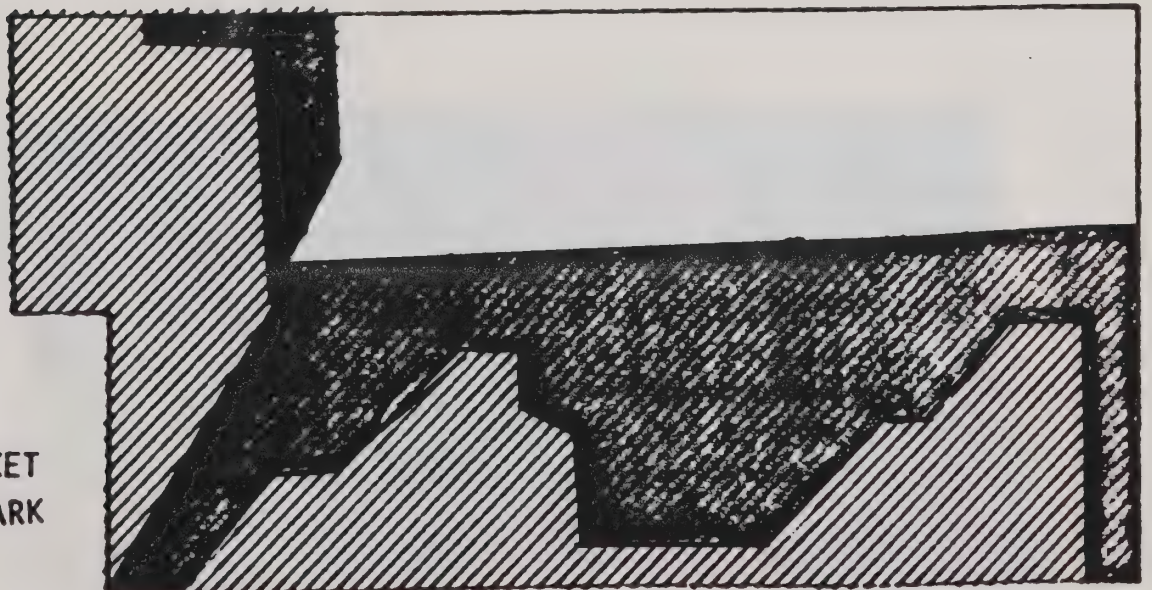
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 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



9/20 08:15





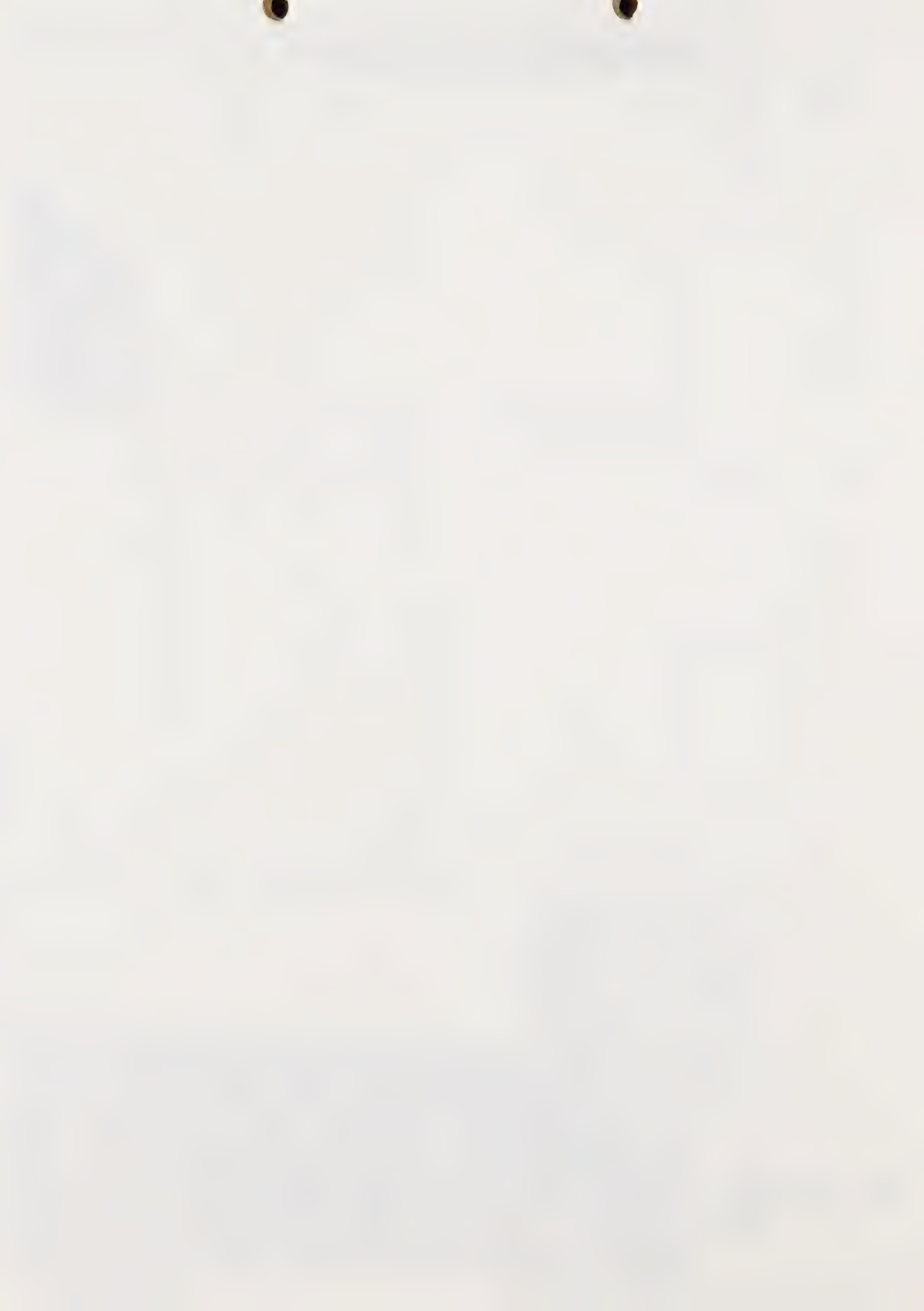
9/20 12:00

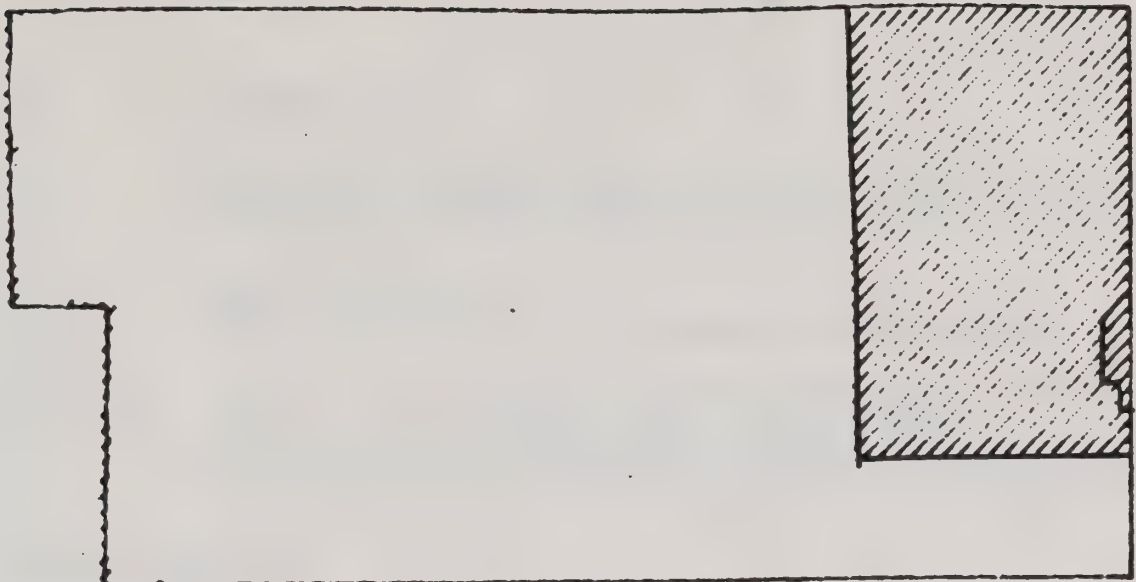


SOUTH OF MARKET
PARK

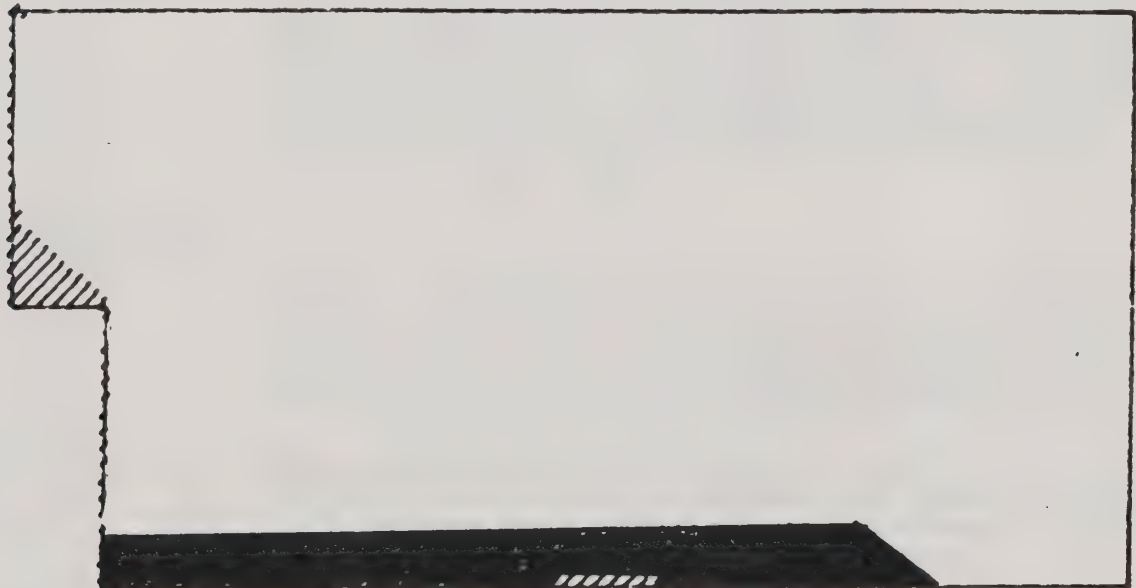
9/20 17:30
Scale: 1" = 50'

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

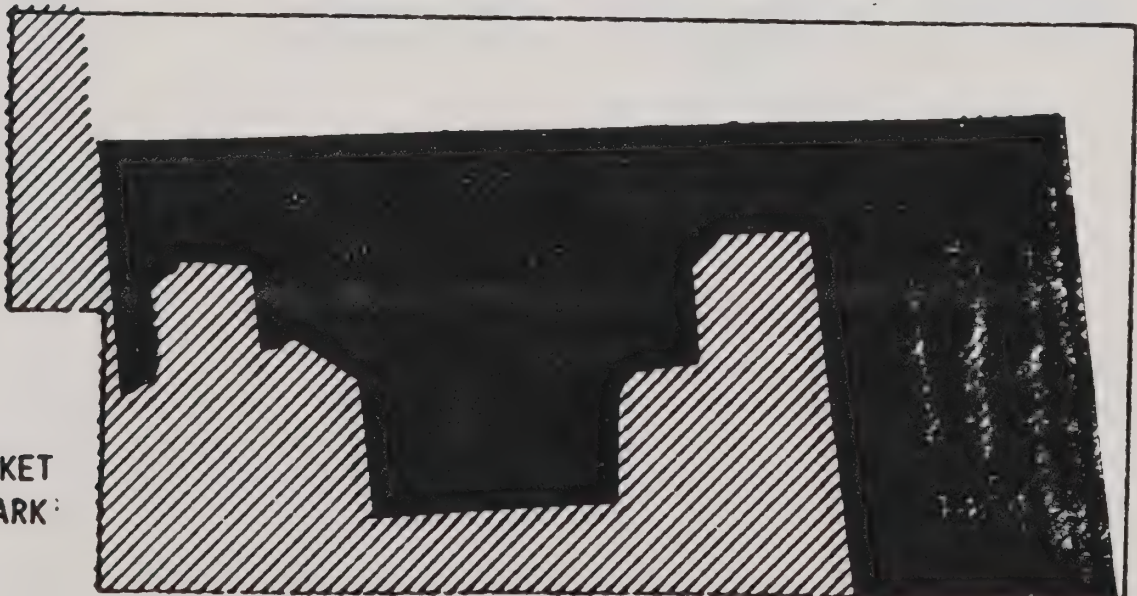




12/20 09:00





12/20 12:00



12/20 15:00
Scale: 1" = 50'

SOUTH OF MARKET
PARK:

-  EXISTING SHADOW
-  MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED

PARK NAME: Boeddeker Park

LOCATION: Ellis, Jones, Eddy & Taylor
Located in a Downtown neighborhood with a high density mix of residential, hotel and retail/restaurant uses.

SIZE: 38,841 square feet
Boeddeker ranks as the fourth smallest Downtown park.

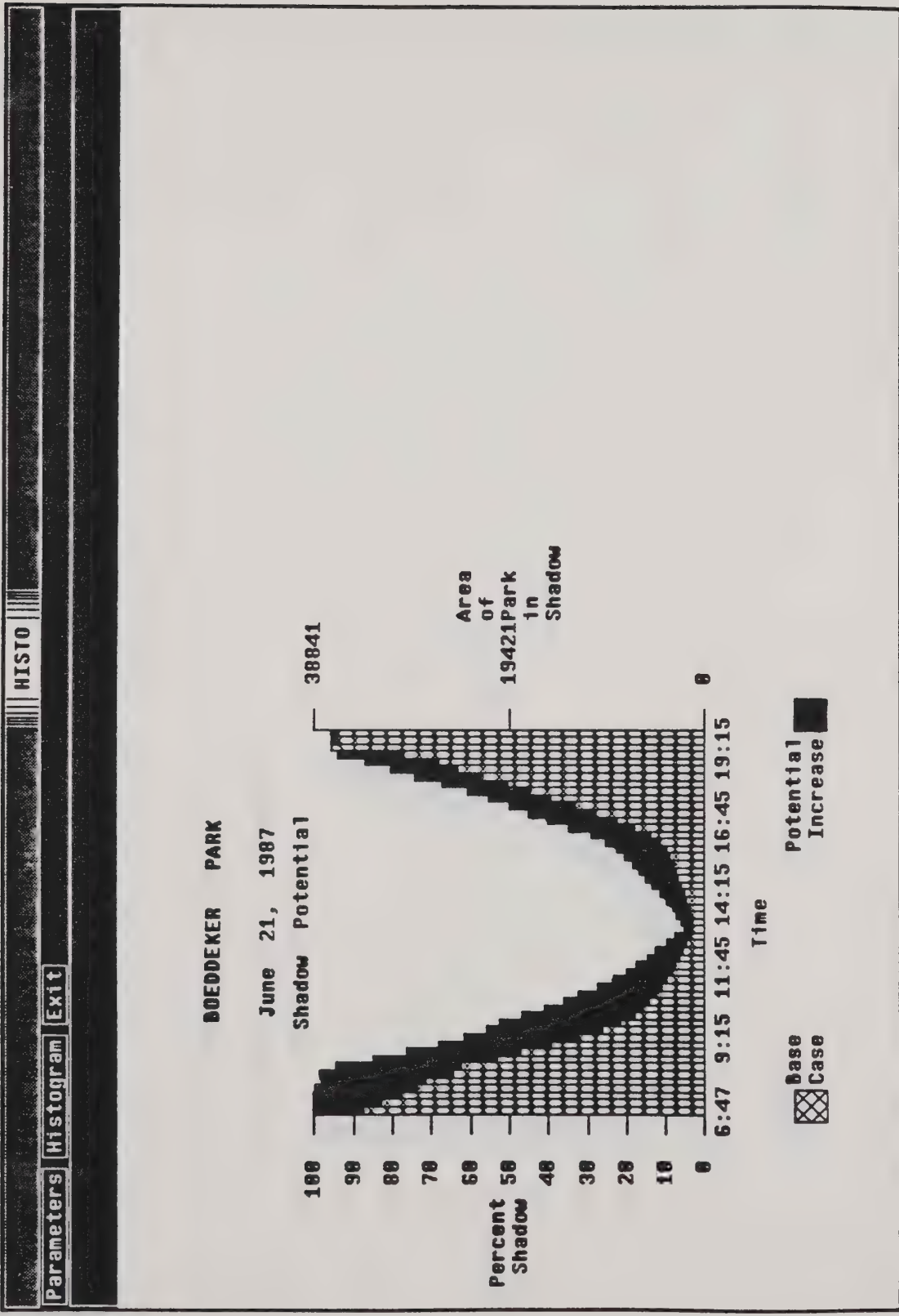
CHARACTERISTICS: Located in the Tenderloin district with entrances from three of the surrounding street, this flat park is primarily used by neighborhood residents. The lawn, trees and playground are the principal features of the park.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: In general the greatest shadows occur in early morning and late afternoon hours. Morning hours are a bit more heavily shaded than the afternoon hours. 37.7% of the annual sun resource is currently in shadow. The shadow profile is generally a "U" shaped curve which flattens out with increased mid-day shadows during the month around the Winter season.

Seasonal Shadow:

- **Summer:** Between 9am and 3pm the range of shadow in the parks runs from as little as 5% shadow to as much as 40% shadow. More shadows occur in the morning hours than after noon time. 20% shadow during Summer Solstice.
- **Spring/Fall:** Shadow patterns during the Spring and Fall are similar to those found during the Summer. The amount of shadow does increase as Fall proceeds and decreases as Spring fades to Summer. 25% shadow during Equinox.
- **Winter:** As much as 50% of the park is in shade during most of the Winter months. Again shadows are greater during the morning hours. 60% shadow during Winter Solstice.



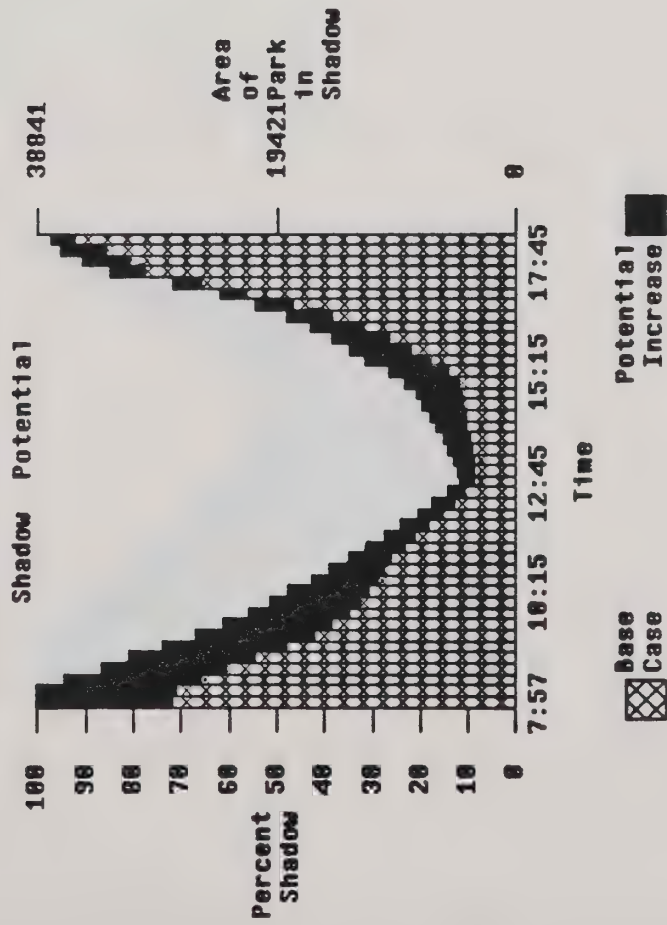


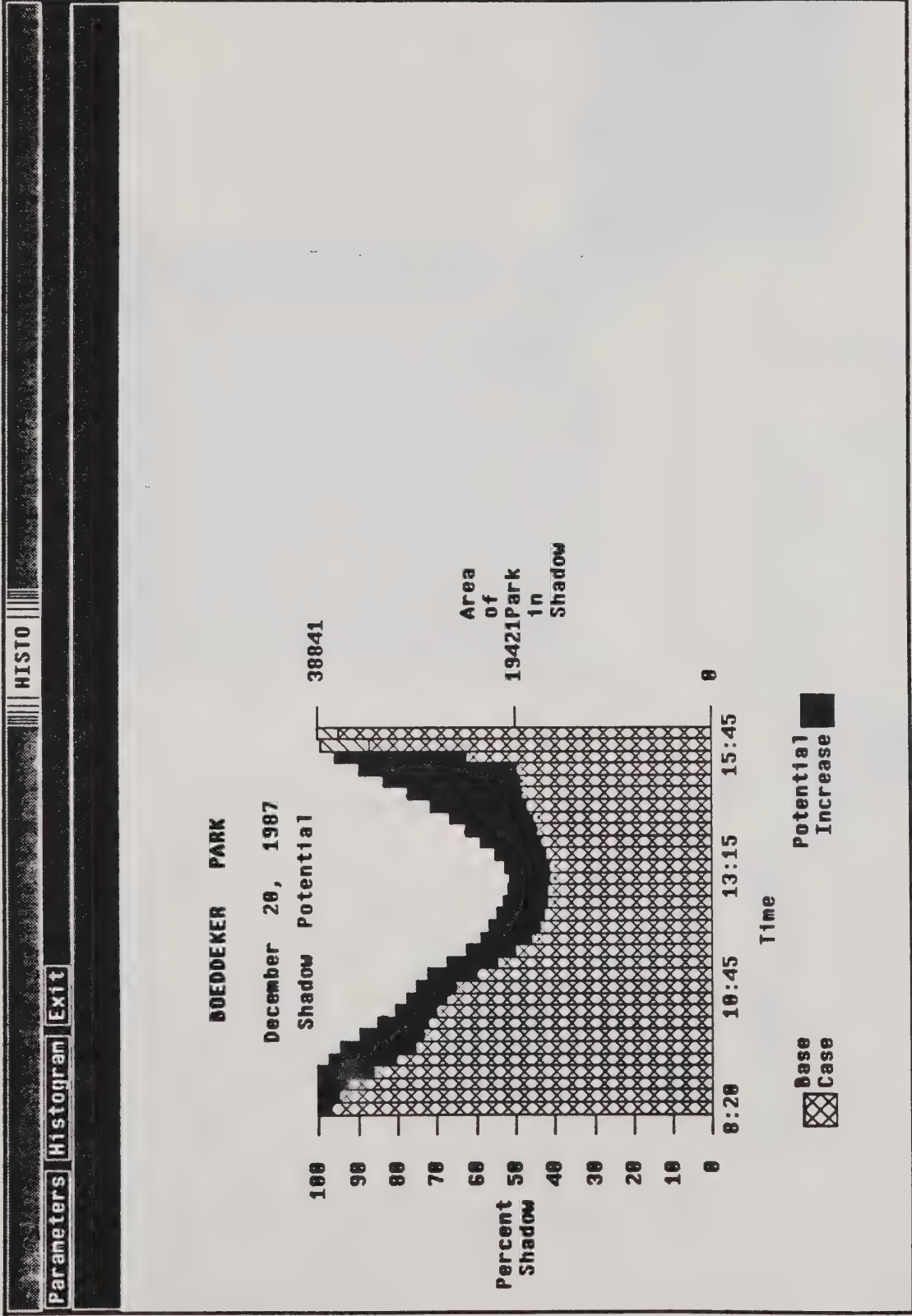
HISTO

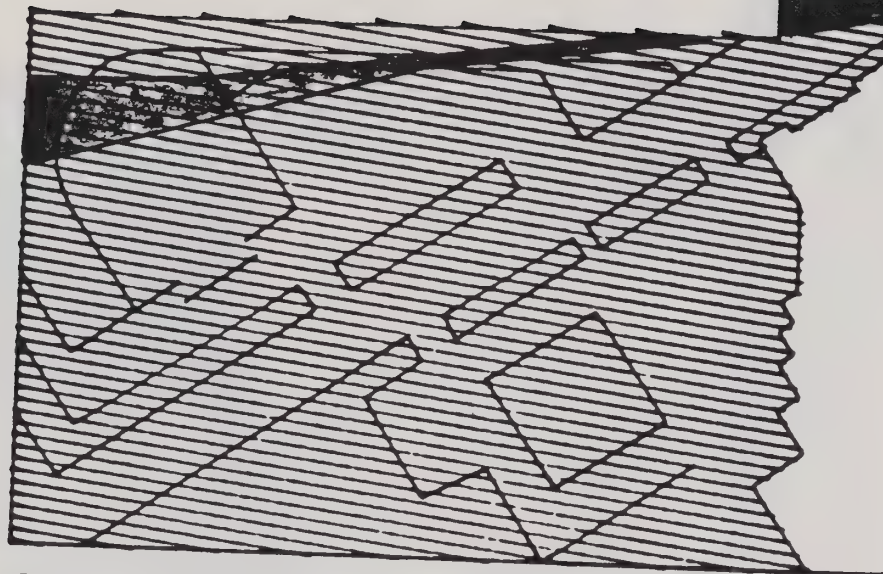
Parameters Histogram Exit

BOEDEKER PARK

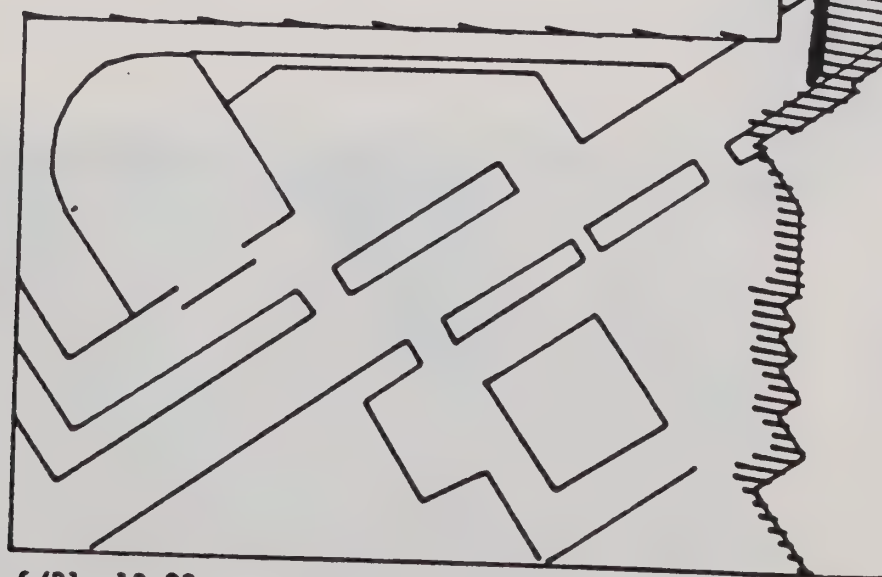
September 28, 1987 (March)





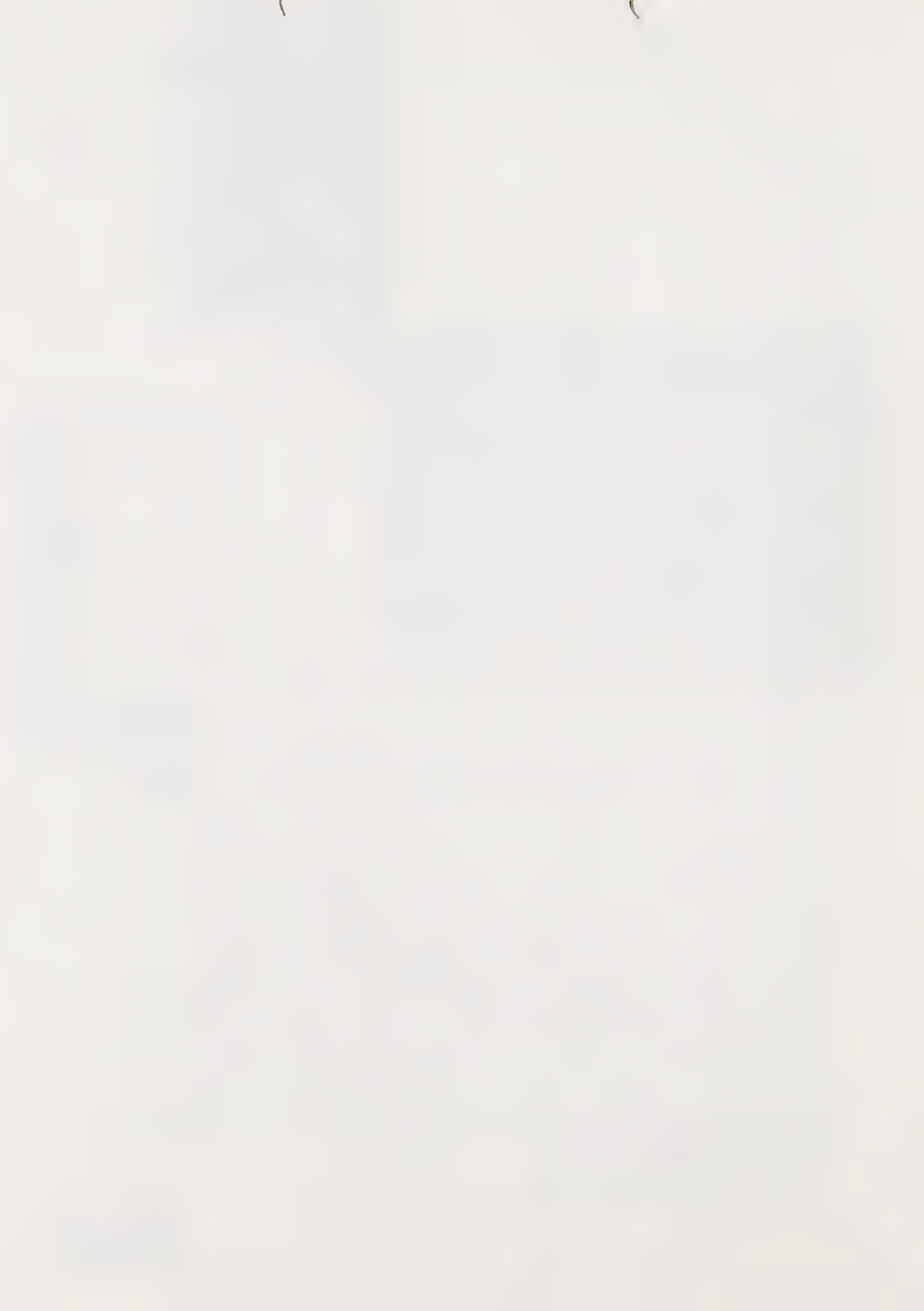


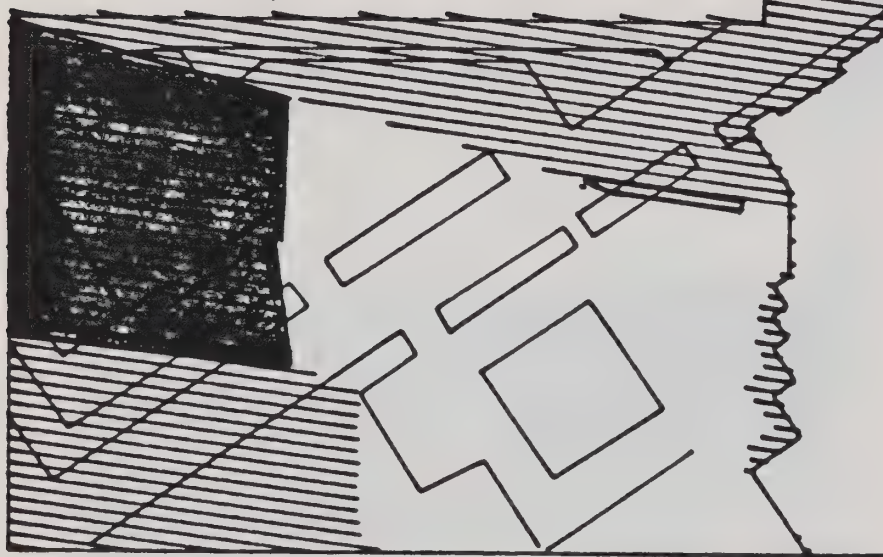
6/21 07:30



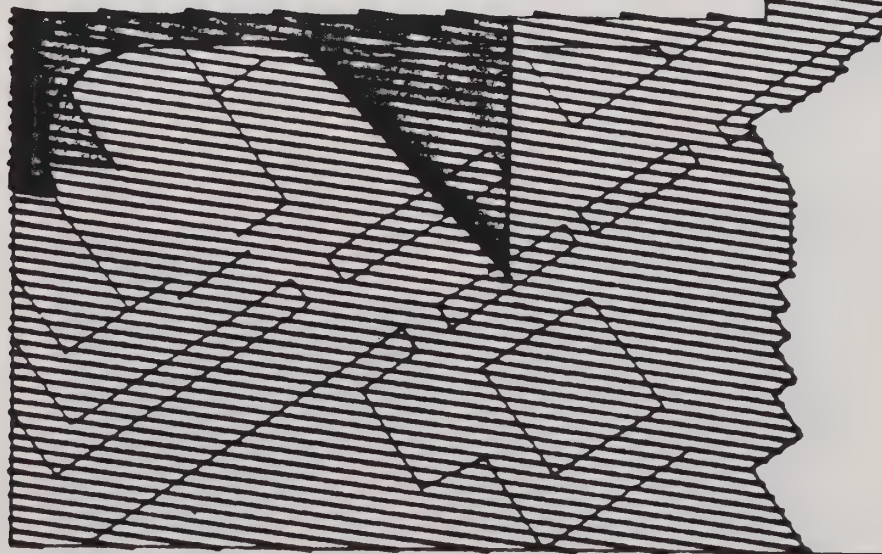
6/21 12:00
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BOEDDEKER PARK

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED







6/21 18:00

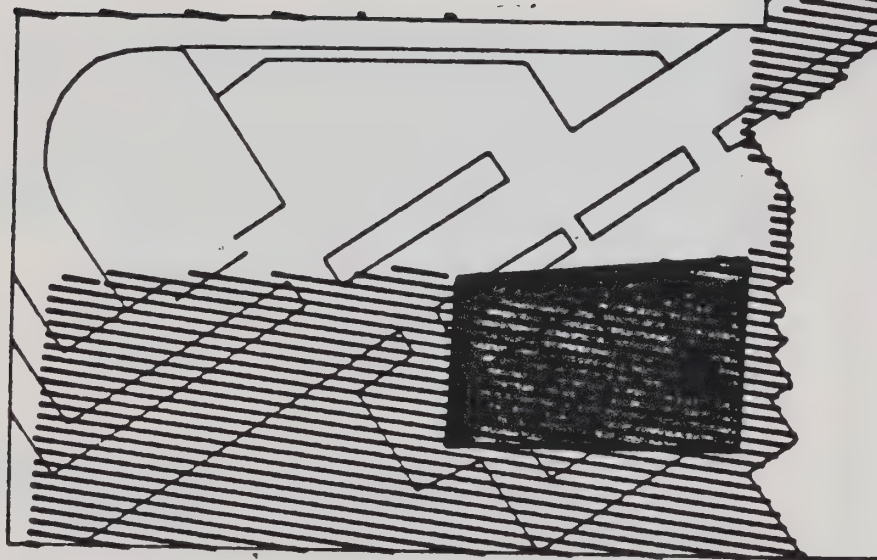


9/20 09:15
Scale: 1" = 50'
BOEDDEKER PARK

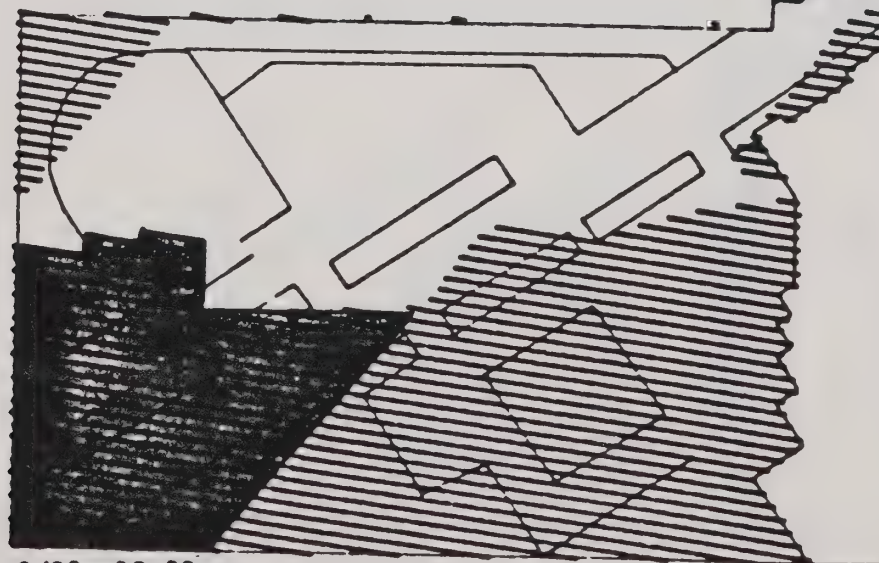
 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED







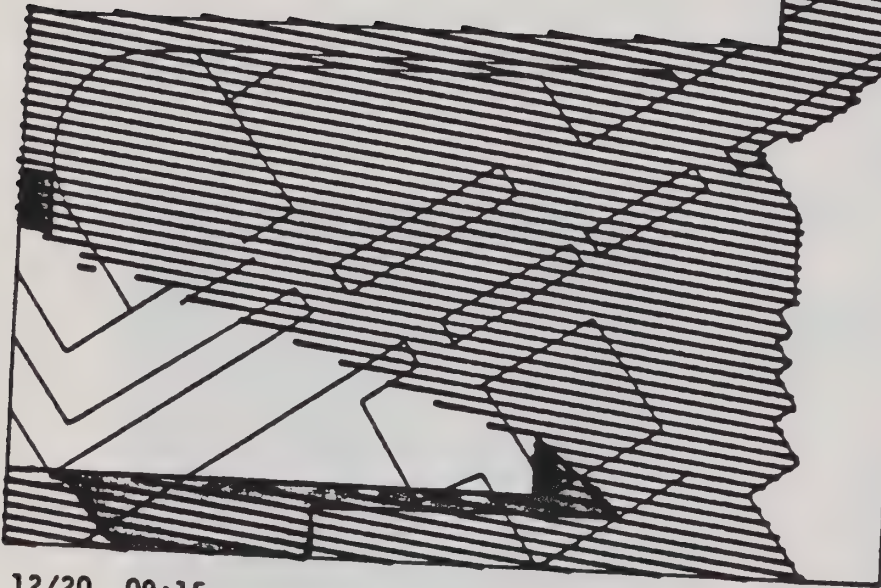
9/20 12:00



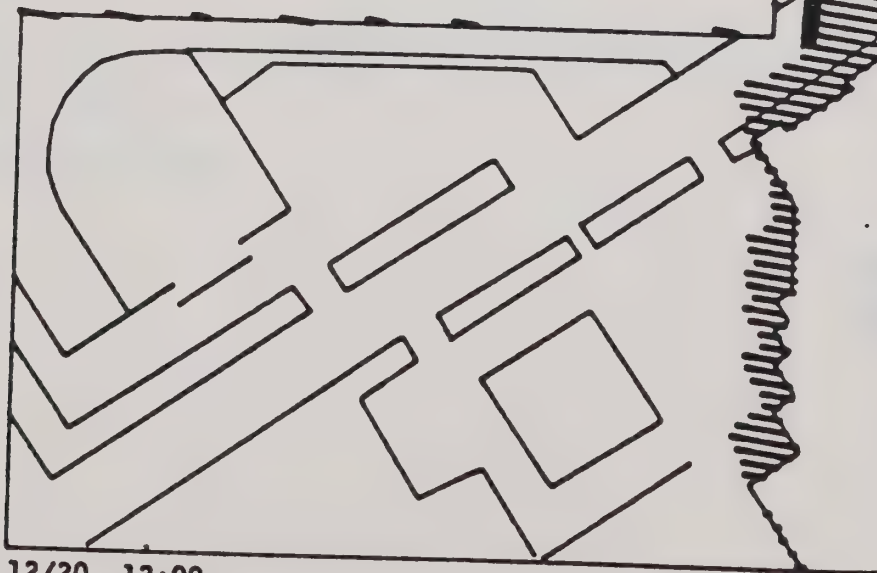
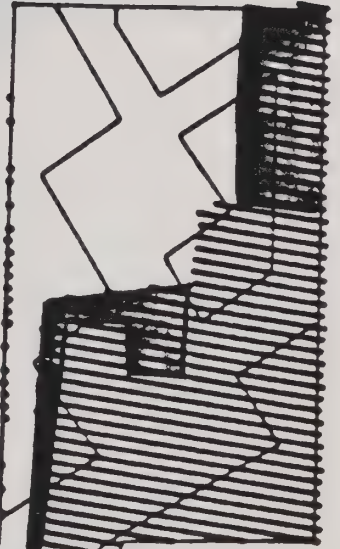
9/20 18:00
Scale: 1" = 50'
BOEDDEKER PARK

EXISTING SHADOW
MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED





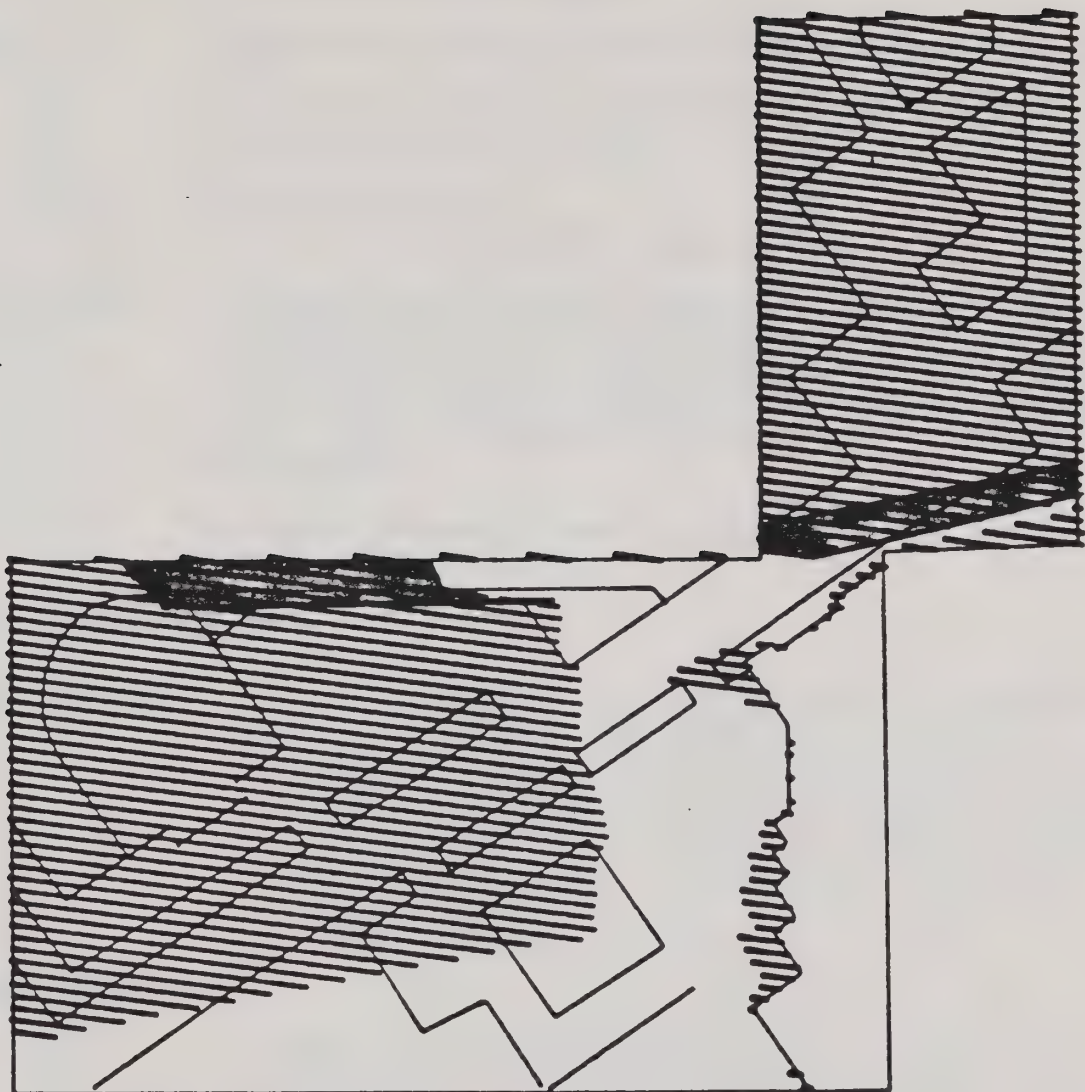


12/20 09:15





12/20 12:00
Scale: 1" = 50'
BOEDDEKER PARK

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED



12/20 15:00
Scale: 1" = 50'
BOEDDEKER PARK

 EXISTING SHADOW
 MAXIMUM ADDITIONAL
SHADOW IF NO LIMIT IS
IMPOSED

PARK NAME: Chinese Recreation Center

LOCATION: South-western corner of the intersection of Washington and Mason

The park is located in a residential neighborhood in Chinatown and near Nob Hill.

SIZE: 28,576 square feet
This is the third smallest Downtown park.

CHARACTERISTICS: This open space contains a gymnasium and an auditorium. The rooftops of these two buildings are accessible and could be developed for future uses. The park also includes a basketball court and children's playground on the western side. These two outdoor recreation areas are located on two levels.

This park is heavily used by neighborhood children when school is not in session.

SUN AND SHADOW CONDITIONS:

Yearly Shadow: Throughout the year the park has greater shadows during the afternoon hours due to the hill to the West. Throughout the year the mid-day shadows range from a minimum of 10% to a maximum of 75% in December. Due to the mid-day shadows in the park the shape of the shadow profile curve is that of a shallow "U" shape until the Winter when the "U" is virtually flat with heavy shadows throughout the day.

Seasonal Shadow:

- **Summer:** Greatest sun resources in this park are during early morning hours. Between 9am and 3pm, 20-30% of the park is in shadow. Shadows are greatest during the afternoon hours. 25% shadow during Summer Solstice.
- **Spring/Fall:** The shadow patterns during these two seasons are similar to those of Summer with increased shadows throughout the day. 30-50% of the park is in shadows between 9am and 3pm. 45% shadowed during Equinox.
- **Winter:** During the Winter months the early morning and late afternoon shadows are more evenly distributed. The park is 50% in the shade during most of the day. 75% shadowed during the Winter Solstice.

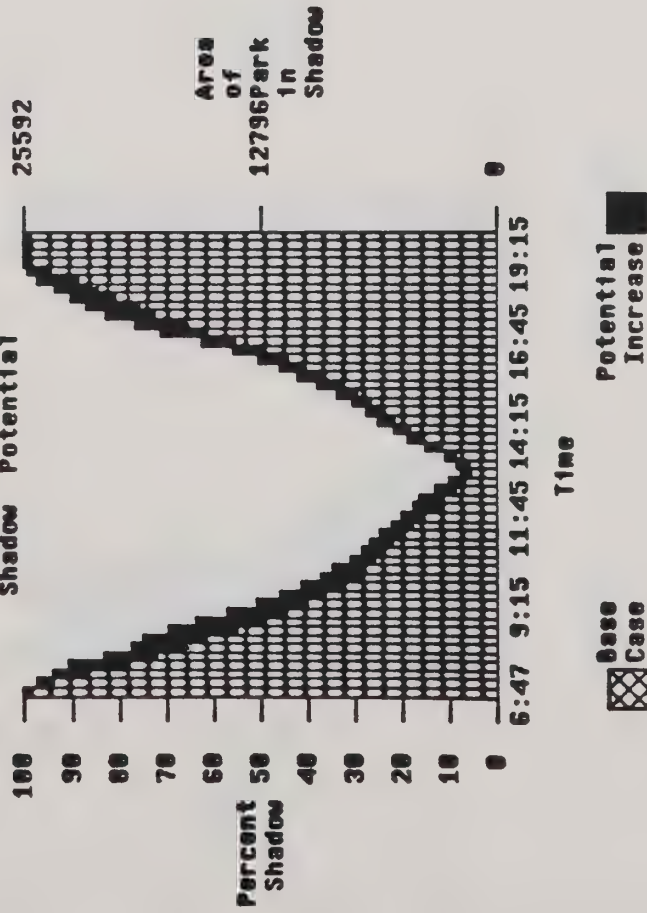
HISTO

Parameters Histogram Exit

CHINESE PLAYGROUND

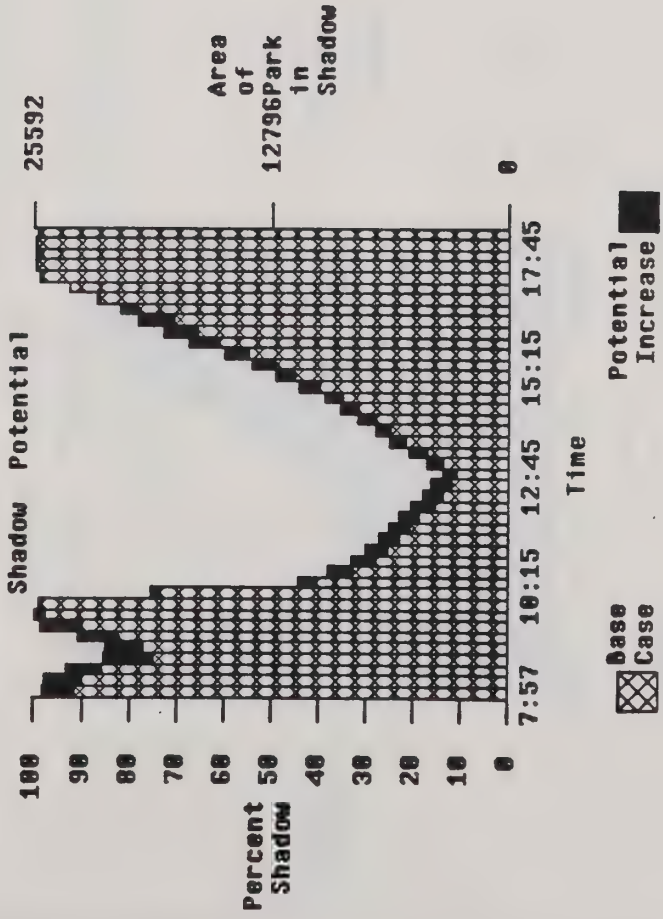
June 21, 1987

Shadow Potential



CHINESE PLAYGROUND

September 20, 1987 (March)





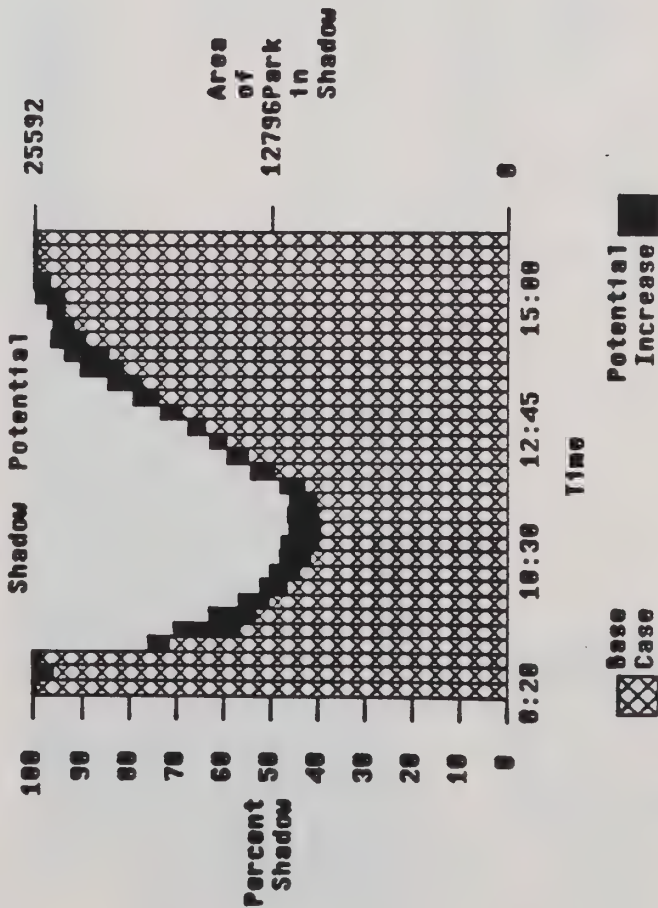
Site Latitude:

HISTO

Parameters Histogram Exit

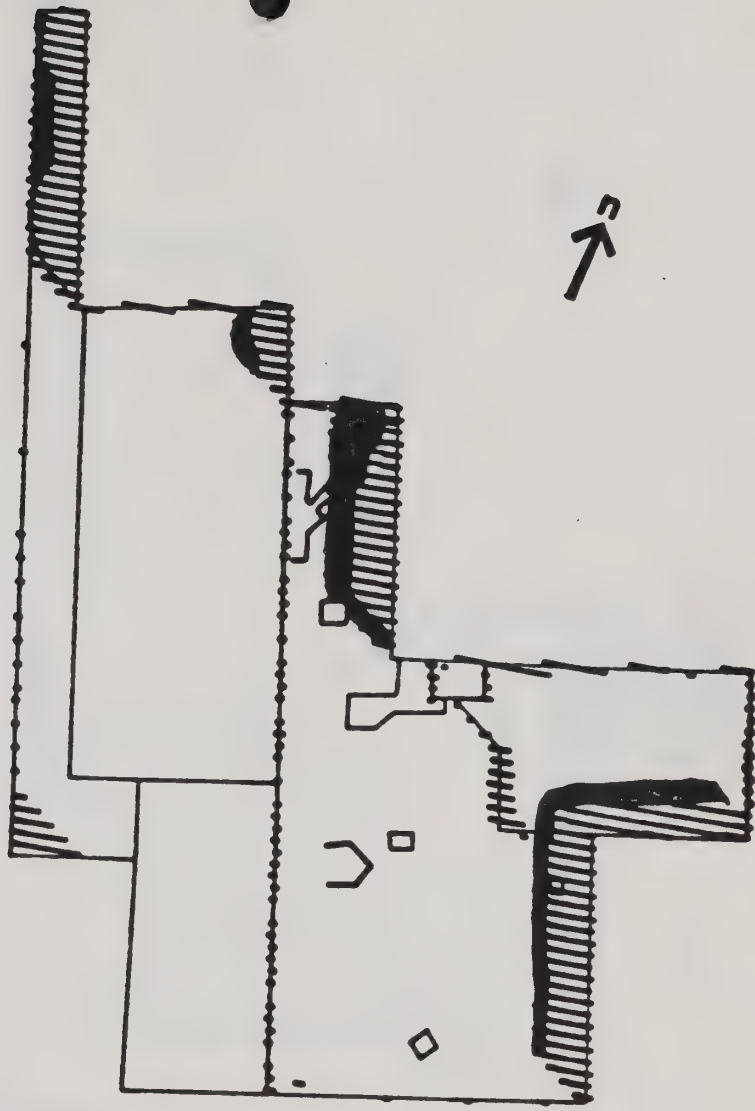
CHINESE PLAYGROUND

December 20, 1987







6/21 07:30

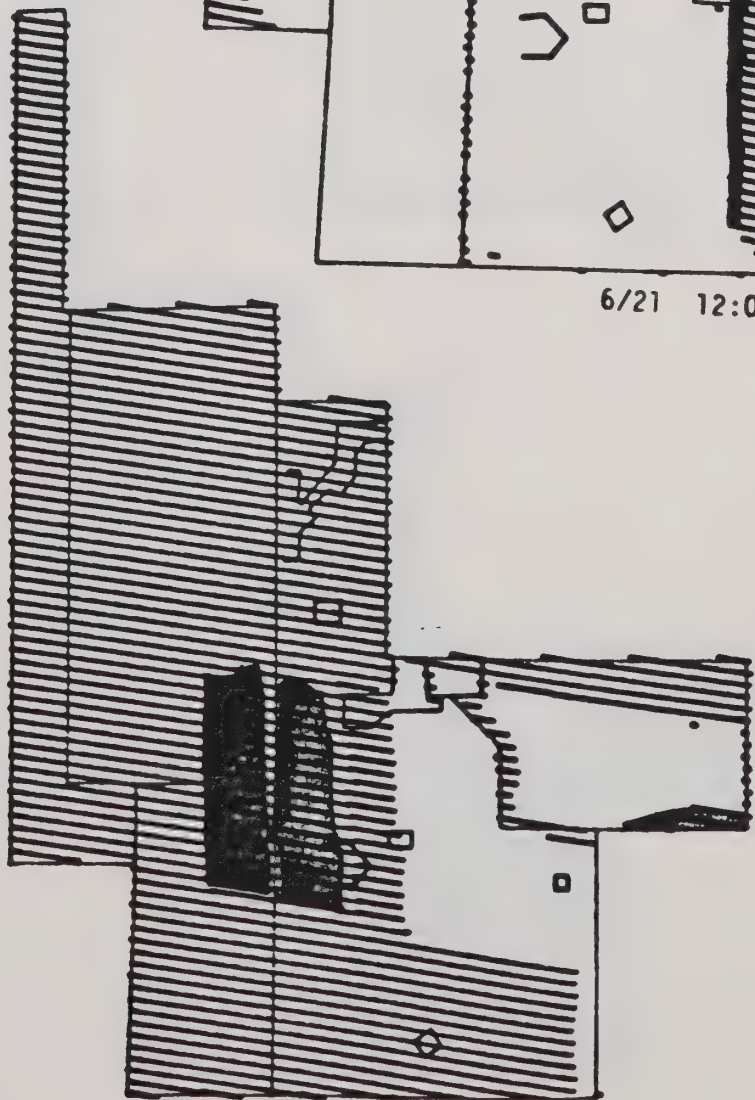


6/21 12:00

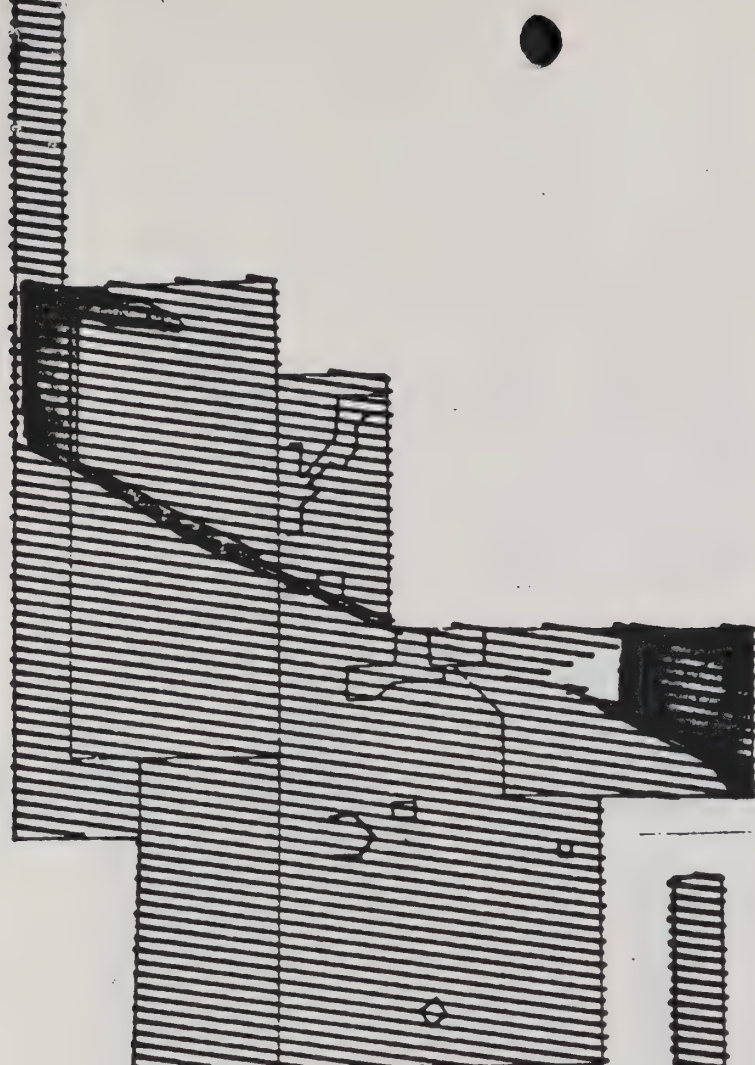


CHINESE PLAYGROUND

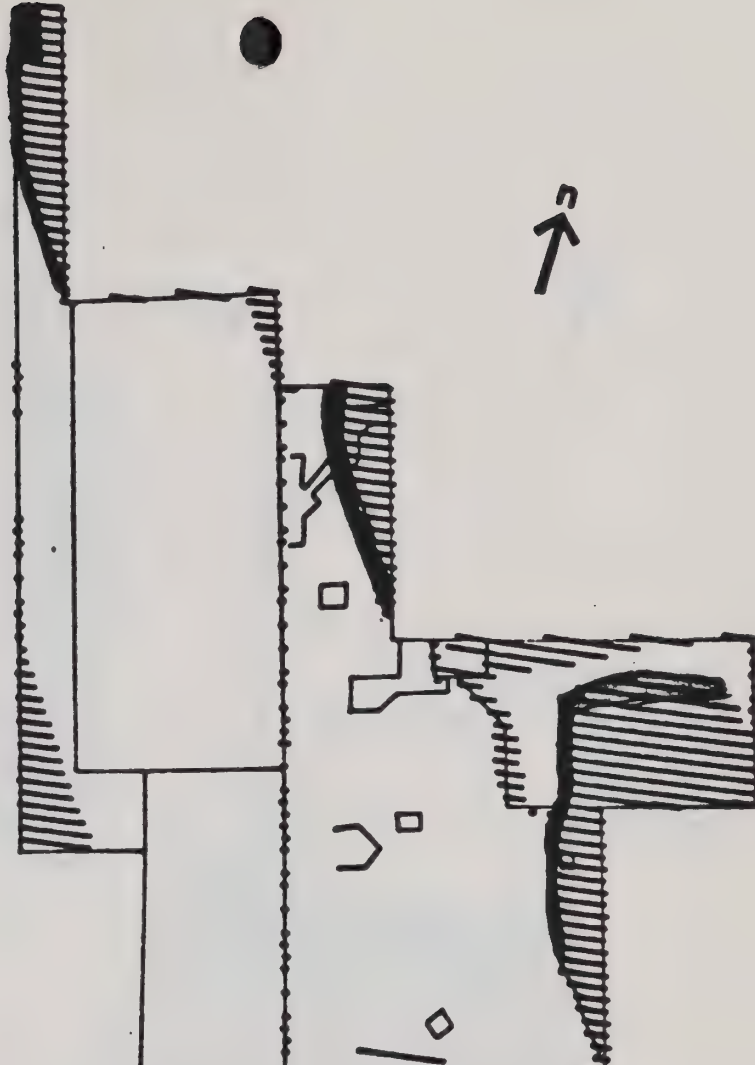
-  EXISTING SHADOW
-  MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



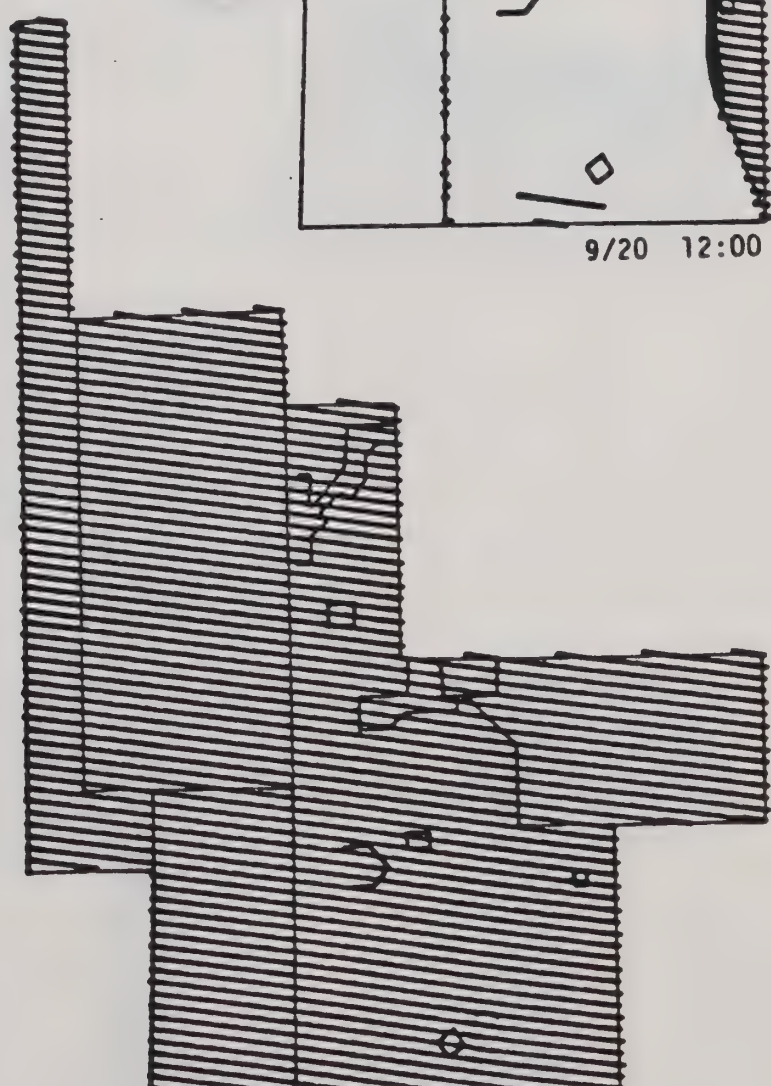
6/21 17:30
Scale: 1" = 50'



9/20 09:15





9/20 12:00

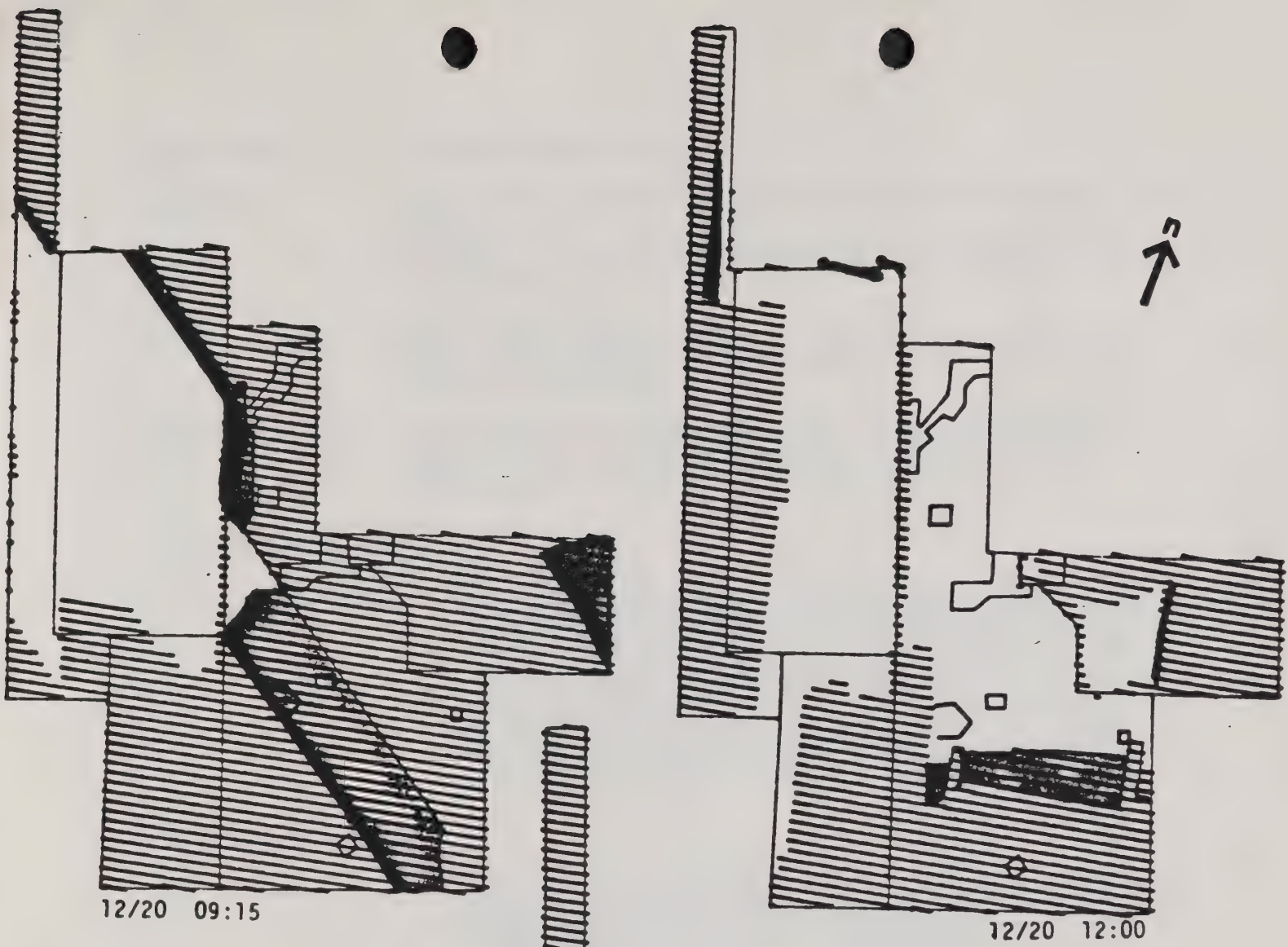


9/20 18:00
Scale: 1" = 50'

CHINESE PLAYGROUND

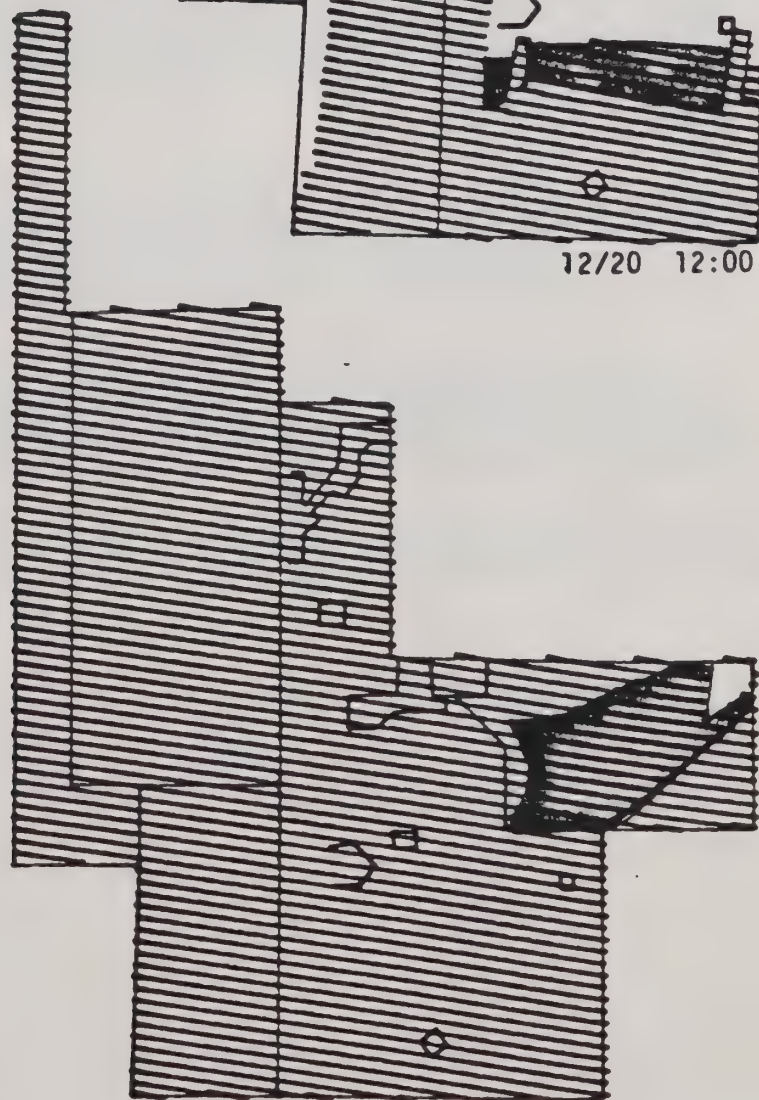
-  EXISTING SHADOW
-  MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED





CHINESE PLAYGROUND

- EXISTING SHADOW
- MAXIMUM ADDITIONAL SHADOW IF NO LIMIT IS IMPOSED



Scale: 1" = 50'

PARK NAME: Sergeant John Macaully

LOCATION: North-western corner of the intersection of O'Farrell and Larkin
The park is surrounded by high density residential and retail uses.

SIZE: 9,021 square feet
This is the smallest downtown park and is located in the Tenderloin District.

CHARACTERISTICS: Park features include grass areas, trees and seating. Users of the open space are primarily neighborhood residents.

SUN AND SHADOW CONDITIONS:

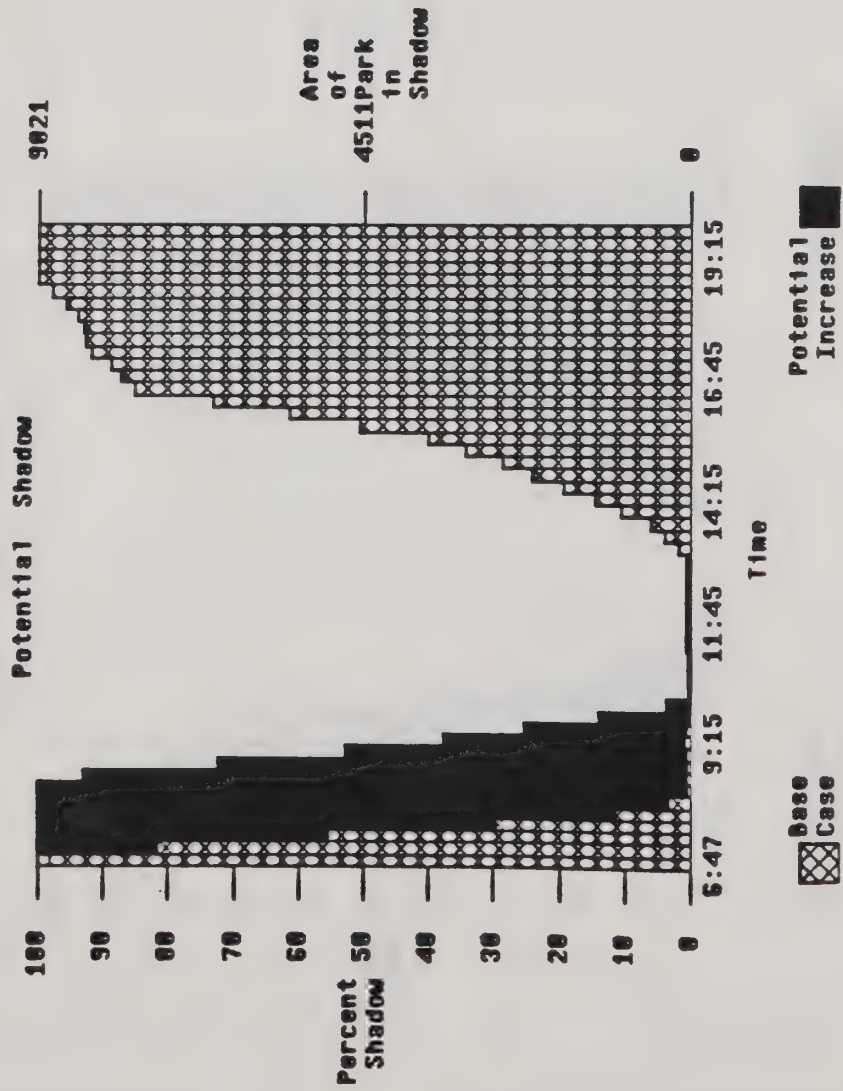
Yearly Shadow: Throughout the year this park is fully shaded in the afternoon hours. Shadows in the morning are initially heavy but decrease rapidly. 41.2% of the existing annual sun resource is in shadow. The "U" shaped shadow profile is shifted toward the morning hours due to the heavy afternoon shadows. During the Winter months the "U" shape to the shadow profile curve is lost due to increased mid-day shadows.

Seasonal Shadow:

- **Summer:** The greatest sun resource in the park occurs during the times between 9am and 1pm. Heavy shadows occur both before 9am and after 1pm. 40% shadowed during the Summer Solstice.
- **Spring/Fall:** The shadow patterns during the Spring and Fall are similar to that of Summer with increased shadows throughout the day and particularly during the hours between 9am and 1pm. 40% shaded during the Equinox.
- **Winter:** Except for one hour around 10am the majority of this open space is in shadows. 70% shaded during the Winter Solstice.

SRT. JOHN MACAULAY PARK

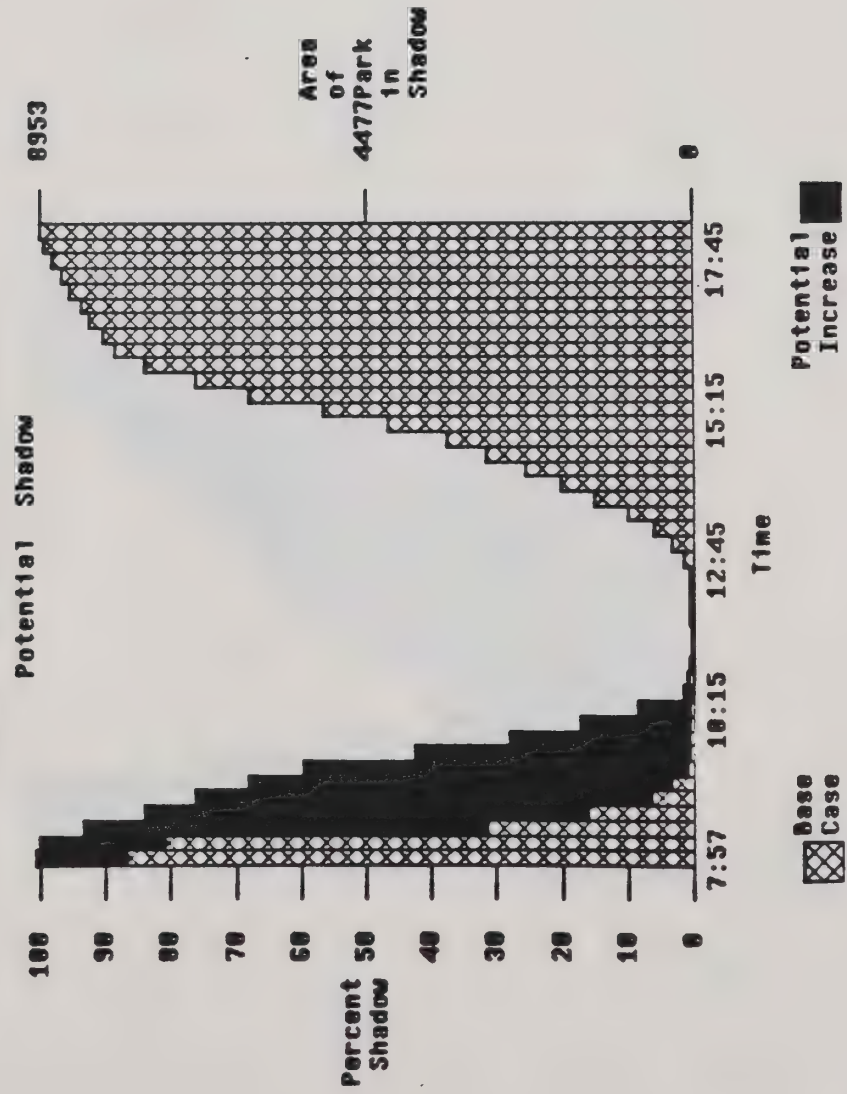
June 21, 1987





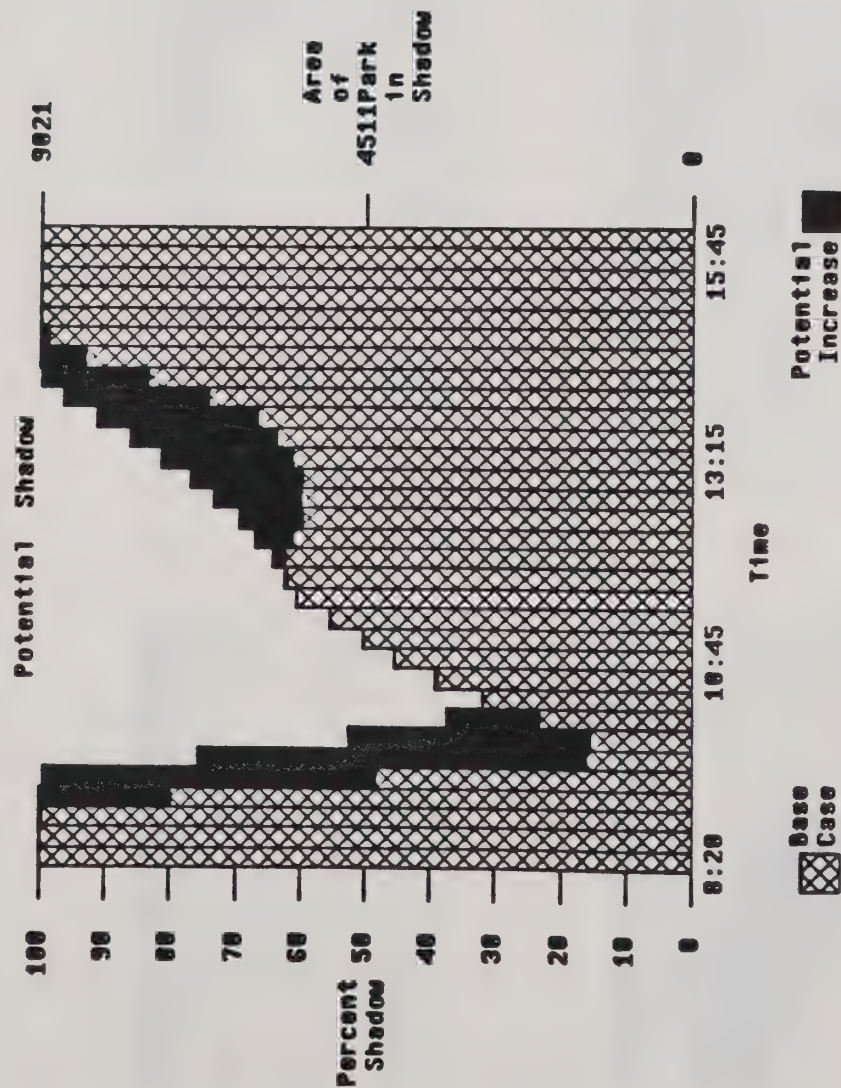
Sgt. JOHN MACAULAY PARK

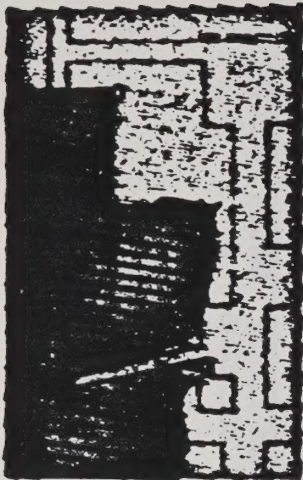
September 20, 1987 (March)



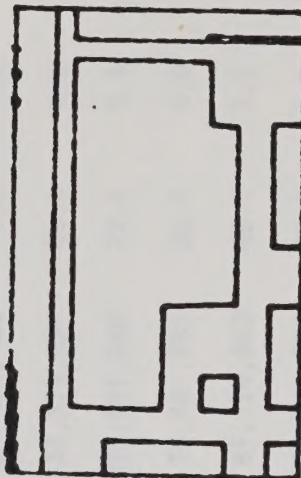
SGT. JOHN MACAULAY PARK

December 20, 1987

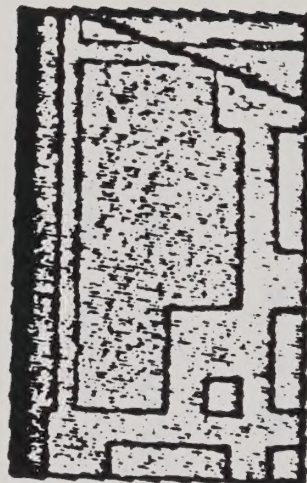




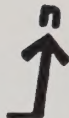
6/21 07:15



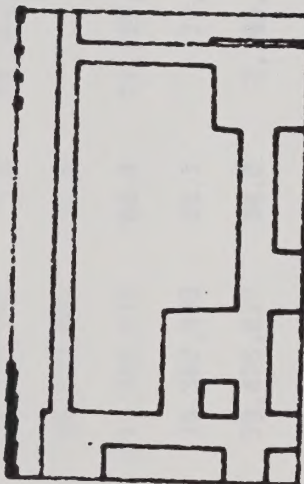
6/21 12:00



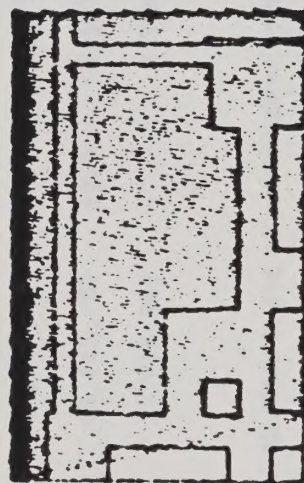
6/21 18:30



9/20 08:15



9/20 12:00



9/20 17:00



12/20 09:15
Scale: 1" = 50'
JOHN MACAULAY



12/20 12:00



12/20 13:30

 EXISTING
 MAXIMUM SHADOW IMPOSED



1000 1000
1000 1000

1000 1000
1000 1000
1000 1000

SUMMARY OF SHADOW IMPACTS

NO.	PARK NAME	PARK AREA	TOTAL FT/HRS	EXISTING SHADOW FT/HRS	% SHADOW	ADDITIONAL† SHADOW FT/HRS	TOTAL POTENTIAL SHADOW FT/HRS	% SHADOW	% INCREASE
1	Civic Center	222,295	827,248,613	61,547,460	7.4	10,404,296	71,951,756	8.7	1.3
2	Embarcadero Plaza 2	149,698	557,086,137	209,319,065	37.6	23,078,115	232,397,180	41.7	4.1
3	Union Square	105,515	392,663,521	150,494,339	38.3	20,911,944	171,406,283	43.7	5.3
4	Washington Square	98,991	368,385,107	21,487,753	5.8	12,593,684	34,081,437	9.3	3.4
5	North Beach	94,930	353,272,502	37,579,831	10.6	0	37,579,831	10.6	0.0
6	Maritime Plaza	83,936	312,359,430	213,685,676	68.4	12,325,572	226,011,248	72.4	3.9
7	Embarcadero Plaza 1	58,395	217,311,153	76,362,983	35.1	78,911	76,441,895	35.2	0.0
8	Portsmouth Square	54,773	203,832,242	79,425,677	39.0	2,289,287	81,714,963	40.1	1.1
9	St. Mary's Square	46,781	174,090,813	90,387,985	51.9	16,711,279	107,099,264	61.5	9.6
10	Huntington Park	46,486	172,993,000	38,052,710	22.0	4,012,794	42,065,504	24.3	2.3
11	South of Market	44,940	167,239,716	12,262,241	7.3	17,248,546	29,510,787	17.6	10.3
12	Boeddecker Park	38,841	144,542,897	54,436,100	37.7	20,125,267	74,561,367	51.6	13.9
13	Chinese Playground	25,592	95,238,069	50,245,182	52.8	5,507,731	55,752,913	58.5	5.8
14	Sgt. MacAulay	9,021	33,570,749	13,816,953	41.2	4,159,261	17,976,214	53.5	12.4

† Additional shadow on parks if no limits were set and all sites in the city were developed to existing height limits.



C124891459